5130 History of American Interior Design (3) Research studies of philosophical and stylistic movements with focus on America of seventeenth, eighteenth, or nineteenth centuries. Prereq: 4792 or consent of instructor. May be repeated. Maximum 9 hrs.

5140 Advanced Research in Historic Preservation (3) Evaluation and application of research methodology to historic preservation projects in interior design. Prereq: Consent of instructor.


5210 Furniture Design (3) Analysis of human factors data in design of body support, task support, and storage furniture pieces and systems; production of construction drawings and scale models. Prereq: 4440 or consent of instructor.

5220-30 Advanced Interior Design Studio (4, 4) Investigation of interior design problems at macro level. Systematic design methodology and design research methods as part of design problem-solving experience. Prereq: Consent of instructor.

5410 Seminar in Design (3) Intensive reading, discussion and critical evaluation of twentieth century design concepts; presentation of design process; design techniques leading to visual innovation. Prereq: 4791 or equivalent.

5420 Advanced Topics in Interior Design (3) Independent research discussion on current specialized topics: interior design, history of design or historic preservation. Variable topics. Prereq: 9 hrs. interior design. May be repeated. Maximum 9 hrs.

5510 Environmental Factors in Interior Design (3) Human factors and associated research techniques related to design of interior architectural environments—deivation of design implications from anatomy, physiology, anthropometry, and behavioral sciences. Prereq: 6 hrs behavioral science, and 6 hrs natural science or consent of instructor.

5520 Environmental Factors in Interior Design (3) Systematic design methodology as applied to design of microenvironments using human factors information. Prereq: 6 hrs behavioral science, and 6 hrs natural science or consent of instructor.

5530 Environmental Factors in Interior Design (3) Human factors and systematic design methodology applied to analysis, synthesis, and evaluation of research-oriented interior design projects. Comprehensive design research project by 2- or 3-member teams. Prereq: 6 hrs behavioral science, and 6 hrs natural science or consent of instructor.

5535 Environmental Design Research (1-3) Evaluation and application of research methodologies to interior design problems. Hours and credit arranged. Prereq: 5510-20-30 or equivalent and consent of department head and instructor in charge of investigations. May be repeated. Maximum 9 hrs.

5810 Problems in Historic Design Studies (1-3) Advanced research in area of historic stylistic movements of interior design within cultural context. Prereq: 5130 or consent of instructor. May be repeated. Maximum 9 hrs.

5820 Problems in Interior Design (1-3) Advanced research in area of interior design. Prereq: 6 hrs graduate interior design or consent of instructor. May be repeated. Maximum 9 hrs.

5830 Problems in Theory of Historic Preservation (1-3) Special topics in historic preservation relevant for interior design. Prereq: 5140 or consent of instructor. May be repeated. Maximum 9 hrs. E

5910-20-30 Seminar (1-4, 1-4, 1-4) Hours and credit arranged. Prereq: Consent of instructor.

6000 Doctoral Research and Dissertation (3-15) Preparation and investigation in design fields. Prereq: 4792 or consent of instructor. May be repeated. Maximum 9 hrs.

6430 Reading and Research in Interior Design (3) Investigations of methodological approaches appropriate to interior design. Prereq: 9 hrs. in graduate level interior design or consent of instructor. May be repeated. Maximum 9 hrs.

6500 Research Seminar (1-3) Required 1 hr for M.S. students, 3 hrs for Ph.D. students. S/NC only.

6510 Environmental Factors I: Theory, Design Decisions and Human Requirements (3) Systems-oriented theoretical approach to models and conceptual perspectives on design, conduct and results of research in variety of fields. Research as it impacts design process and decision-making and communication models for guiding research in textiles, apparel and interior design. Prereq: 18 hrs of graduate credit.


6535 Environmental Design Analysis (3) Advanced methodology in psychology of environmental design, multidisciplinary research and data methodologies. Prereq: 5510-20-30 or equivalent.

6540 Advanced Topics in Environmental Design (3) Integrative problem-solving seminar/studio involving multidisciplinary points of view and inputs. Systems approach: Composition of seminar: design disciplines as well as social and behavioral sciences. Moderate scale design problems of commercial nature requiring data from several disciplines: retailing, business, hotel management, Prereq: Consent of instructor.

Textiles and Apparel

The Department of Textiles, Merchandising, and Design offers the Master's degree with concentrations in textiles and apparel. Students are expected to have a good foundation in one of these areas to enter the program. The program of study will prepare students for careers in industry, business, public and private agencies, and educational institutions. Interested students should contact the Department Head for more information.

THE MASTER'S PROGRAM

Thesis Option:
Major (minimum of 9 hours of 5000 courses) 18 hrs
Thesis
Minor (minimum of 12 hours of 5000 courses) 18 hrs

TOTAL 45 hrs

5150 Principles of Design Analysis (3) Application of design principles and theories to analysis of existing physical environments. Prereq: Consent of instructor.

5210 Furniture Design (3) Analysis of human factors in design. Prereq: 12 hrs graduate coursework in area other than Home Economics with the approval of the major professor.

An oral examination is required.

4210 Elementary Textile Microscopy (3) Microscopic techniques are applied to the study of textile fibers and fabrics. Prereq: 4010. 1 hr and 2 labs. W, A

4280 Design Analysis: Functional Apparel (3) Systematic design approach to apparel design integrating aesthetic, psychological, social and physiological aspects of apparel problems for special reference groups. Garment specifications translated for production. W

4410 Apparel Production Management (3) Management perspective of apparel production industry: production planning, process, and management of human resources. Plant tours and case studies on production problems. Field trips required. S

4460 The Consumer and the Market (3) Analysis of consumer decision-making and problems in the marketplace. Consumer issues and policies with emphasis on consumer choice, information, consumer protection and current issues. Prereq: 4280.

4520 Principles of Retail Management (3) Analysis of retail sector of economy from management perspective. Approaches to decision-making in retail operations, promotion, pricing, control, product mix strategy. Prereq: Marketing 3110, 3120 or equivalent. F, W, Sp

5000 Thesis (1-15) S/NC only. E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5110 Textiles Testing and Methods of Research in Textiles (3) Physical and chemical testing. Research methods. 3 labs. Sp


5150 Principles of Design Analysis (3) Application of flat pattern theory to garment design incorporating relationships of fabric geometry, texture, hand, and subsequent garment assembly. Prereq: Consent of instructor. 1 hr and 2 labs. W

5170 Socio-Psychological Aspects of Clothing (3) Clothing as it relates to human behavior. Prereq: 6 hrs or equivalent from sociology and psychology. W

5180 Advanced Textile and Apparel Economics (3) Economic problems of current importance in textile and apparel industries. Production, consumption, and governmental policy. Prereq: 6 hrs economics or consent of instructor. Sp

5220 Historic Textiles (3) Development of textile industry in world, fibers used, design, and color. F

5240 Practicum (1-9) Off-campus experience with business, industry, governmental agencies and civic groups; preplanned; supervised; apparel, historic, merchandising, textiles. Prereq: 12 hrs graduate coursework in topic area, consent of major advisor and department head. May be repeated. Maximum 9 hrs. S/NC only. E

5250-60-70 Problems in Textile Chemistry (4, 4, 4) Theoretical and experimental study of chemistry of textile fibers including polymerization, reactions, dying and finishing. 5250 must be taken first, 5260 and 5270 need not be taken in sequence. 5250—Emphasis on structure; property relationships and reactions of fibers. 5260—Emphasis on finishes. 5270—Emphasis on dyes and colorants. Prereq: 18 hrs chemistry or equivalent; 1 qtr organic chemistry. 2 hrs and 2 labs. F

5310 Fashion Analysis (2) Fashion as social and economic force; evolutionary theories of fashion operation. Prereq: 6 hrs each of sociology and economics.


5410 Consumer Economics (3) Economic framework for evaluating consumer behavior and analyzing consumer issues, using economic models of consumer choice: consumer preference, consumption and demand models. Prereq: 6 hrs. economics or consent of instructor.


5510 Retail Management Information Systems (3) Approaches to acquisition and management of information for retail decision-making. Intense research and use by retailers in merchandise management, forecasting, purchase order management, credit management, gross margin, financial and sales productivity. Computer based systems. Prereq: 4520, W
5520 Retailing Strategy and Decision-making (3) Development of analytical decision-making skills utilizing team case format. Strategy design in selected retail operational areas; issues pertaining to long-range comprehensive planning of company mission and objective. Prereq: 4520 and 5510 or equivalent. Sp

5560 Textile Processing (3) Methods and mechanics of texturing continuous filament yarns, methods and mechanics of processing staple yarns, spinning system, composite yarns weaving, knitting, non-woven fabrics. Prereq: Engineering Science and Mechanics 3311, Mathematics 2840. (Same as Polymer Engineering 5610.)


5700 Current Topics in Textiles and Apparel (1-3) Lecture, group discussion, individual research and study on specialized topics: apparel production management, functional design, handicapped/elderly, new process finishing, preservation, thermal, toxicity. Prereq: 9 hrs textiles/apparel graduate coursework. May be repeated. Maximum 9 hrs. E

5800 Problems in Textiles and Apparel (1-3) Advanced individual study selected from field of textiles and apparel: apparel, American, European, and international historic textiles, merchandising, textiles. Prereq: 9 hrs textiles/apparel graduate coursework. May be repeated. Maximum 9 hrs. E

5900 Seminar in Textiles and Clothing (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

6000 Doctoral Research and Dissertation (3-15) P/ NP only. E

6010 Advanced Studies in Textiles and Apparel (3) Independent analysis of major philosophies, theories, methods, and research: apparel, historic, merchandising, textiles. Prereq: 9 hrs graduate coursework, 5160, or consent of instructor. May be repeated. Maximum 6 hrs. E

6110 Selected Issues in Textiles and Apparel (3) Lecture, group discussion, individual research on advanced topics and research areas of current significance: future directions, professional issues, theoretical approaches. Prereq: 9 hrs graduate coursework. May be repeated. Maximum 9 hrs. E

6150 Social-Psychological Theories of Clothing Consumption (3) Analysis and evaluation of social science theories of consumer behavior in relation to apparel and textiles. Prereq: 5 hrs graduate level sociology or psychology and 5170 or equivalent, or consent of instructor. Sp

6160 Textile Flammability (3) Factors affecting textile flammability as consumer issue. Standards, regulations, test methods, economic impact. Prereq: 5120, 5180, 5250, or consent of instructor.

6170 Physical Performance Behavior of Textile Structures (3) Fundamentals of yarns and fabric structures; relationship of structure to physical characteristics of textile materials. Prereq: 5120, or consent of instructor.
### Aviation Systems

**MAJOR**

**DEGREE**

**Aviation Systems**

**M.S.**

**Lead Professor:**

R. D. Kimberlin, M.S. Tennessee.

**Professors:**

F. G. Collins, Ph.D. California (Berkeley); W. Frost, Ph.D. Washington; A. A. Mason, Ph.D., Tennessee; J. M. Wu, Ph.D., California Institute of Technology; R. L. Young, Ph.D. Northwestern.

**Assistant Professors:**

W. B. Baker, Jr., Ph.D. Tennessee; V. K. Smith, III, Ph.D. Georgia Institute of Technology.

**Title Professor:**

R. D. Kimberlin, M.S. Tennessee.

**Assistant Professors:**

W. D. Collins, Ph.D. California (Berkeley); W. Frost, Ph.D. Washington; A. A. Mason, Ph.D., Tennessee; J. M. Wu, Ph.D., California Institute of Technology; R. L. Young, Ph.D. Northwestern.

**Assistance Professors:**

W. B. Baker, Jr., Ph.D. Tennessee; V. K. Smith, III, Ph.D. Georgia Institute of Technology.

The University of Tennessee Space Institute offers a program leading to the Master of Science with a major in Aviation Systems. The Aviation Systems program is designed for those who possess a Bachelor's degree in engineering or science and who wish to study under a "systems philosophy" toward careers in research and development or administration in various phases pertinent to aviation. To qualify for admission to this program, the applicant must possess a Bachelor's degree in engineering or science and who wish to study under a "systems philosophy" toward careers in research and development or administration in various phases pertinent to aviation. The applicant must possess a Bachelor's degree in engineering or science from a recognized institution, show evidence of ability to pursue and benefit from the program, and fulfill The University of Tennessee Graduate School admission procedures and grade point standards. Subject matter prerequisite to the program includes basic knowledge of computer utilization, a background in statistics, a basic understanding of aerodynamic fundamentals, aircraft propulsion and performance, a background in accounting and a basic knowledge of economics.

Both thesis and non-thesis programs are available. The thesis program involves satisfactory completion of the following minimum requirements:

1. 18 hours in the major field of aviation systems.
2. For the research and development area, Industrial Engineering 5700 and 5710; for the administration area, Economics 5030 and 5090.
3. 6 hours of electives selected from the major field, engineering and/or the areas in item 2.
4. 9 hours in Aviation Systems 5000, Thesis, demonstrating the ability to conduct and report on an independent investigation.

The non-thesis program will be permitted in special circumstances and involves satisfactory completion of the following minimum requirements:

1. 18 hours in the major field of aviation systems.
2. For the research and development area, Industrial Engineering 5700, 5710, and 5720; for the administration area, in Economics 5030, and Finance 5010-20.
3. 6 hours of electives in one of the areas in item 2.
4. 6 hours of electives in the major field, engineering and/or the areas in item 2.
5. Satisfactory completion of Aviation Systems 5100.
6. Satisfactory completion of a comprehensive final written examination on all course work submitted for the degree and defense of the project course paper.

The thesis program involves 45 quarter-hour credits minimum while the non-thesis program involves 51 quarter-hour credits minimum.

**5000 Thesis (1-15) P/NP only.**

**5090 Governmental Policies for Aviation (3) Theoretical and legal basis for economic and governmental regulation of aviation.**

**5210-20 Experimental Flight Mechanics (3) Flight mechanics, experimental techniques.**

**5570 Special Topics in Aviation Systems (3) Current problems in aviation systems.**

### Comparative and Experimental Medicine

**MAJOR**

**DEGREE**

**Aviation Systems**

**M.S., Ph.D.**

**Comparative and Experimental Medicine**

**M.S., Ph.D.**

**Joint Graduate Coordinating Committee:**

H. Kitchen (Chairperson); J. E. Fuhr; R. A. Griswold; J. E. Lawler; R. L. Michel.

The Comparative and Experimental Medicine degree program (M.S. and Ph.D.) is a jointly administered graduate program intended to prepare students for teaching and/or research careers in the health sciences. This program emphasizes the comparative approach to the study of pathology, immunopathology, aberrant metabolism, oncology, and genetic disorders. The Ph.D. program is open to approved graduate students seeking training in this area and is especially useful for individuals with professional degrees. For the student with an undergraduate biological science background, the Comparative and Experimental Medicine program provides an unusual opportunity to study disease processes common in humans and animals from a multidisciplinary perspective. The scope of this intercollegiate program, which pools faculty resources from both veterinary and human medicine, is broadened by faculty members representing animal science and numerous areas of the life sciences. The interdisciplinary training environment includes such diverse support as facilities and personnel at the Veterinary Teaching Hospital, the Oak Ridge National Laboratory, the Knoxville Zoological Park, Hemophilia Clinic, Birth Defect Clinic, Aberrant Metabolism Laboratory, and Hematology and Oncology services.

For specific course listings please see College of Veterinary Medicine, page 36 and College of Medicine—Knoxville Unit, page 186 in this catalog.

**ADMISSION REQUIREMENTS**

**General Requirements:** Admission requirements of The Graduate School of UTK will
apply. In addition, all applicants will be required to furnish three letters of recommendation from individuals who are familiar with their scholastic or professional records.

Requirements for Admission to the Master of Science Degree Program: Applicants will be required to have a professional degree in one of the medical sciences (M.D., D.D.S., D.V.M.) or a baccalaureate degree with course work including chemistry through organic, mathematics through calculus, one year of physics, one year of basic biology plus an additional half-year of more advanced study in the field of biology including courses such as biochemistry, mammalian anatomy, histology, cell biology, or others that are appropriate for individuals aspiring to research careers in biomedical science.

Applicants for admission to the Master of Science degree program whose backgrounds include no formal training in the biological field beyond the baccalaureate degree will be required to present evidence of satisfactory performance on the Graduate Record Examination.

Requirements for Admission to the Doctor of Philosophy Degree Program: Applicants will generally be expected to have a Master's degree in one of the biological sciences or a professional degree in one of the medical sciences.

Selected individuals having baccalaureate degrees with strong backgrounds in the physical and biological sciences may be admitted without obtaining evidence of satisfactory performance on the Graduate Record Examination.

Exceptions to the above requirements may be made at the discretion of the Admissions Committees if the minimum requirements of The Graduate School have been met. Applicants who are admitted to graduate programs but who are lacking in course requirements will be required to correct these deficiencies early in their graduate programs.

For additional information, see sections in this catalog on College of Veterinary Medicine and College of Medicine—Knoxville, or write to the Admissions and Graduate Programs, P.O. Box 1071, Knoxville, TN 37901.

**Ecology**

**DEGREES**

**Ecology**

M.S., Ph.D.

D. L. Bunting, Director, Ph.D. Oklahoma State; B. L. Dearder, Associate Director, Ph.D. Colorado State; P. A. Delcourt, Associate Director, Ph.D. Montana.

Shared Faculty:


The Graduate Program in Ecology offers Master of Science and Doctor of Philosophy degrees. This interdepartmental program provides advanced courses in contemporary ecology for undergraduate and graduate programs in basic and applied biology, social sciences, mathematics and engineering. Research opportunities in both fundamental and applied ecology are intended to prepare students for academic careers as well as professional positions in industry or government. The Environmental Sciences Division of the Oak Ridge National Laboratory, the National Park Service, and the Tennessee Valley Authority provide advisors and research facilities. The Great Smoky Mountains, Cumberland Plateau, valley and ridge topography, TVA lakes and wild rivers provide locally a spectrum of natural habitats and consequent biological diversity that is truly unique. In addition, faculty research programs provide opportunities for student research elsewhere on this campus.

**ADMISSION REQUIREMENTS**

Requirements for admission to this program are:

1. admission to The Graduate School; (2) chemistry through organic, mathematics through calculus, and 4 quarter hours of ecology at the upper division level; (3) departmental application and 3 rating forms; (4) the Graduate Record Examination.

Application forms for admission should be obtained from The Graduate School. Inquiries concerning the admission requirements should be addressed to the Chairperson, Graduate Program in Ecology, University of Tennessee, Knoxville, Tennessee 37968-1610.

**ADVISORS**

Advisors are selected from ecologists on the shared faculty of the University who have competence in the area in which the student expects to work. Entering students should consult early with the chairperson of the program on the choice of a faculty advisor who will become the chairperson of the student's faculty committee.

**THE MASTER'S PROGRAM**

The minimum 45 quarter hours of graduate credit shall include Ecology 5210-20-30 or equivalent and 9 hours of Thesis 5000. In addition, at least 8 hours must be selected from among nine ecology course categories. A maximum of four of these nine must be represented and one of these must be quantitative methods. The remainder of a student's course program is determined in consultation with the faculty. At least 8 hours exclusive of 5210-20-30, must be in courses numbered above 5100.

The general requirements for this Master's degree are listed in page 22. A minor in ecology is available.

**THE DOCTORAL PROGRAM**

The requirements for this degree are in general the same as those of the Master's program. A student cannot enroll for dissertation until the research proposal has been discussed and approved by the doctoral committee. A foreign language is required.

**5000 Thesis** (1-15) P/NP only. E

**5175 Environmental Planning** (3) Same as Planning 5175.

**5190 Development Planning in the Third World** (3) Same as Planning 5190.


**5320 Principles of Ecology: Ecosystems (3)** Patterns, underlying principles behind short and long-term dynamics, energetics and nutrient cycling of terrestrial, freshwater and marine ecosystems. Prereq: 5220.

**5310 Ecology for Planners and Engineers (3)** Ecological principles and effects that human-caused changes have on living organisms. Lectures and field trips. For students in Graduate School of Planning and Environmental Engineering.

**5320 Implementation of Environmental Policy (3)** Goals and problems of environmental legislation, especially National Environmental Policy Act; purpose, preparation, and evaluation of environmental impact statements and similar multidisciplinary studies. Prereq: 5210 or 5310, or Environmental Engineering 4820.

**5370 Natural Resource Management and Environmental Assessment in Developing Nations (3)** Assessment of environmental and resource development issues. Scientific basis for integrated resource management and environmental assessment in developing nations. Prereq: Environmental or equivalent. (Same as Botany 5370.)

**5610 Environmental Toxicology (3) Same as Biochemistry 5610.**

**5640 Techniques in Environmental Toxicology (3) Same as Biochemistry 5640.**
6000 Doctoral Research and Dissertation (3-15) P/ NP only. E
6100 Special Topics in Ecology (3) Seminars on advanced topics and recent developments in ecology. Prereq: Consent of instructor. May be repeated.
6110 Seminar in Animal Behavior (2)
6120 Seminar in Aquatic Ecology (2)
6130 Seminar in Physiological Ecology (3)
6140 Seminar in Community Ecology (2)
6150 Seminar in Radiation Ecology (2)
6160 Seminar in Systems Ecology (2)
6370 Applied Ecology (4) Review of contemporary and historical issues. Analysis of scientific basis of environmental assessment and natural resource management. Analysis of careers and career planning in applied ecology. Prereq: 5210-20-30 or equivalent or consent of instructor. (Same as Botany 6370.)
6431 Current Topics in Environmental Toxicology (1) (Same as Biochemistry 6431.) S/N/C only.

Industrial and Organizational Psychology

MAJOR DEGREES

Industrial and Organizational Psychology M.S., Ph.D.
Committee: J. M. Larson, Jr. (Chairperson); W. H. Calhoun; H. D. Dewhirst; R. L. Jenkins; R. T. Ladd; J. W. Lounsbury; M. C. Rush; J. E. A. Russell; E. Sundstrom; R. G. O'Brien.

(For complete Faculty Listing, see Department of Management and Psychology)

The master's and doctoral programs are offered jointly by the Department of Psychology and the Department of Management. They are designed to prepare students for personnel, managerial, and organizational research, for university teaching, and for consulting relationships with industry. The program emphasizes a scientist-practitioner model in applying and conducting research based on accepted theoretical and methodological principles.

The graduate program in Life Sciences/Intercollegiate Programs provides opportunities for students to pursue advanced study in areas of life sciences other than those specifically offered by the departments. The program is designed to complement the programs of individual departments and to augment the programs of individual departments.

Degree Requirements

1. Attainment of a B average*** in Management or Psychology 5170-80-90.
2. Completion of a comprehensive examination in general psychology within no more than two years of entry by attaining a score of 650 or the 90th percentile on the GRE Subject Test in Psychology.
3. Completion of a comprehensive examination in scientific methodology before beginning the third year of study. The examination covers the following specific areas: statistics, psychometrics, experimental design.
4. Completion of a special comprehensive examination in the area of the student's major research and professional interest.
5. Completion of an oral examination following the preparation of a doctoral dissertation. This examination covers the field of doctoral research and related topics, and must be passed at least four weeks prior to the awarding of the degree.
6. Maintenance of at least 3.0 grade point average.

Life Sciences

MAJOR DEGREES

Life Sciences M.S., Ph.D.

Coordinating Council:
H. I. Adler (Chair), Physiology; H. G. Welch; Biotechnology: D. K. Dougall; Cellular, Molecular and Developmental Biology: J. M. Becker; Environmental Toxicology: W. R. Farkas; Ethology: G. B. Burghardt; Plant Physiology and Genetics: O. J. Schwarz.

The programs leading to the M.S. and Ph.D. degrees in Life Sciences are interdepartmental and intercollegiate programs which augment the programs of individual departments.

The graduate program in Life Sciences...

*May be repeated for additional credit.

**Any student in the doctoral program may be required to prepare a Master's thesis by the Industrial and Organizational Psychology Committee. This policy will be implemented by the committee at such time as a review of the student's record suggests that additional data on the qualifications for pursuing a Ph.D. are required.

***See program handbook for definition of a B average.
supports studies and research in the following concentration areas in biotechnology, cellular, molecular and developmental biology, environmental toxicology, ethology, plant physiology and genetics. Students interested in any of these areas should contact the Graduate Program Director or the director of the area of interest. Each concentration area is overseen by a committee and may have unique admission and graduation requirements above the minimums for the overall program.

ADMISSION REQUIREMENTS

1. A Bachelor's degree with a major in a biological, behavioral or physical science.
2. GRE (general) scores.
3. Three letters of recommendation.
4. Course work including a year of calculus (differential and integral), one year of chemistry, and a year of physics. Specific course deficiencies may be corrected during the first year.

PROGRAM REQUIREMENTS

The Master's program requires 45 hours of course work, including a thesis, and a comprehensive oral examination. The minimum requirements for the doctoral program include at least 9 hours above the 6000 level, 36 hours of course work, and a thesis. The student's committee, a comprehensive examination, a doctoral dissertation, and a final examination. Individual concentration areas may have additional requirements.

AREAS OF CONCENTRATION

Physiology: The inter-departmental program in physiology includes research in the areas of regulatory, reproductive, comparative, exercise, cellular, developmental, muscle, or neuro-physiology.

Biotechnology: The biotechnology program will prepare students to participate in the wide variety of opportunities presented by the use of living cells and their components for the production of useful materials. This will be achieved at the M.S. level by a prescribed course of study in the biology and biochemistry of cells and molecules in the first year. Further, an annual study of cells and of engineering aspects of biotechnology in the second year and by the development of special expertise in areas such as animal embryo manipulation, automated chemical synthesis of macromolecules, bioprocess engineering, bioproducts and biotransformations, liposomes, microscopy and image processing, monoclonal antibodies and hybridoma technology, plant tissue culture, recombinant DNA technology and risk assessment and modeling. The production of a research thesis or an industrial co-op experience plus an area of specialization will also be an important part of the training experience.

Cellular, Molecular and Developmental Biology: The inter-departmental program in cellular, molecular and developmental biology includes research in structural or functional aspects of cells or subcellular components, or the interactions between cells.

Environmental Toxicology: The toxicology program provides intensive training in basic toxicological principles and techniques. Courses and research expose trainees to mechanisms of intended and unintended interactions between living systems and potentially toxic agents from the point of view of biochemistry, physiology, ecology, public health, environmental law and regulation, pest management, pollution control and repair, and testing and residue analysis of toxicants.

Ethology: Ethology is the naturalistic study of normally occurring animal and human behavior. The program provides intensive training in basic ethology with specialized studies available in the development, evolution, and physiology of behavior; human ethology; and behavioral ecology and sociobiology.

Plant Physiology and Genetics: This program provides the opportunity for intensive training and research experience in areas transcending the usual boundaries of botany, biochemistry, and agricultural plant sciences. It devotes itself to seeking solutions of problems concerning the interactions of physiology and genetics in applied and fundamental aspects of plant science.

5000 Thesis (1-15) N/PI only. E
5002 Non-Thesis Graduation Completion (3) Required for the non-thesis student not otherwise registered during any quarter. Such a student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
5010 Biotechnology Seminar (1) Seminar to address topics of importance to biotechnology; repeatable to a maximum of 6 credit hours.
5100 Special Topics in Life Sciences (1-3) Specializations in biotechnology, cellular, molecular, and developmental biology; environmental toxicology; ethology; plant physiology and genetics; and physiology. May be repeated. Maximum 9 hrs.
5109 Research Practicum in Life Sciences (1-3) Individual sections for each of biotechnology, cellular, molecular, and developmental biology; environmental toxicology; ethology; plant physiology and genetics; and physiology. May be repeated. Maximum 9 hrs.
5110-20-30 Cellular and Molecular Biology (3, 3, 3) Survey of cell structures and functions at molecular and supramolecular level. 5110—Cellular organization; cell metabolism; energy production and use; membrane structure and function; cellular communication; 5120—DNA structure and function; immune functions; DNA replication, repair and recombination; chromosome structure and genomic organization. 5130—Transcription and RNA processing; translation; control and regulation. Prerequisite: Consent of instructor.
5119-29 Techniques in Cellular and Molecular Biology (3) Growth of microorganisms, analysis of extracellular and intracellular components. 5129—Subcellular fractionation procedures; purification of macromolecules. Prerequisite: Consent of instructor.
5129 Recombinant DNA Laboratory (3) (Same as Microbiology 5139.)
5209 Biotechnology Practicum (Co-operative Experience) (3) Work experience in a commercial organization for students undertaking the non-thesis option of the biotechnology concentration. An evaluation by supervisor and a written report by the student are required. May be repeated once, maximum 6 hours.
6000 Doctoral Research and Dissertation (3-15) N/PI only. E
6100 Advanced Topics in Life Sciences (3) Variable topics. May be repeated. Maximum 9 hours.

Management Science

MAJOR DEGREE
Management Science M.S.
Committee:

THE MASTER'S PROGRAM

The M.S. program in Management Science is designed as preparation for a career in the application of quantitative techniques for the solution of complex problems. The program's flexibility also makes it appropriate as preparation for doctoral study in Management Science. Management Science course work will expose students to both the theoretical development of quantitative techniques and their application to managerial decision making. In addition to the development of sufficient mathematical maturity for creative use of quantitative skills, the program requires concentrated study in a supporting area. Supporting areas are available in other departments of the College of Business Administration (excluding statistics) as well as in computer science, public administration, ecology and other areas, subject to approval by the Management Science Committee.

ADMISSIONS REQUIREMENTS

The Master's program requires three graduate school rating forms and the GRE. The GMAT is acceptable in lieu of the GRE. Applications are encouraged from all majors, but mathematics background equivalent of the completion of at least two years of college calculus and proficiency in a computer language (e.g., Computer Science 3150) is required. The program is designed to be completed in one calendar year by full-time students. However, students may start the program in any quarter and may pursue an M.S. degree in Management Science on a part-time basis.

Course Requirements:

Quarter Hours
Management Science 5310 20-30 35-40 14
Applied concentration area (approved by advisor) 12
Statistics 5110 3
Statistics elective (5000 level or above) 3
Mathematics (4000 level or above) 6
Electives selected from mathematics, statistics, computer science, and/or management science 6
Electives in any area approved by advisor 6
Total 50

A thesis option is available which substitutes 9 hours of thesis credit for the following 14 hours of course work: Management Science 5335-40, and one 3-hour course in the applied concentration area and 6 hours of electives in any area. The Management Science Committee will work closely with the student in tailoring a program to his/her needs. The committee must approve a tentative overall program during
the student's first quarter and must approve all courses on a quarter-by-quarter basis.

Recognizing the diverse backgrounds and needs of Management Science M.S. students, the Management Science Committee is prepared to waive some of the above requirements on an individual basis. For example, an undergraduate mathematics major with a strong background may be allowed to take 6 additional hours of electives in place of the mathematics requirements. On the other hand, a student lacking experience in rigorous senior-level mathematics courses will be asked to take such courses to fulfill the 6-hour mathematics requirement. The total course load will remain 50 hours for all non-thesis students and 45 hours for all thesis students; however, the number of hours of electives can be reasonably expected to vary between 6 and 18 as a function of prior background.

For course listings and description of the Ph.D. program in Management Science, refer to p. 49.

Statistics

MAJOR

Statistics

Program Faculty:
D. L. Sylwester, Statistics, (Chairperson);
Henry Fribourg, Plant and Soil Science;
S. W. Huck, Educational and Counseling Psychology;
Mary Leitnaker, Statistics;
J. B. McLaren, Animal Science;
Robert McLean, Statistics;
Ralph O'Brien, Statistics;
John Phipps, Statistics;
Gipsie Ranney, Statistics;
Richard Sanders, Statistics;
James Schmidhammer, Statistics;
Charles Thigpen, Statistics;
Mary Sue Younger, Statistics.

The Intercollegiate Graduate Statistics Program is a formal University of Tennessee academic program established to recognize graduate students for completing the requirements of a major or minor in statistics as part of their degrees. The Program enables a student to obtain the M.S. in Statistics alone or simultaneously with the Ph.D., DBA, or Ed.D. degree in another department. The Program also enables a student to obtain a statistics minor along with the M.S., Ph.D., DBA, or Ed.D. degree in another department. The Program is administered by an Executive Committee with advisory input from the Program faculty. The Program is open to well-qualified graduate students in all departments which have an approved statistics minor and/or joint major curriculum offered through the Program. Curriculum requirements for the statistics component of each joint degree are specified in terms of completion of alternative sequences of course options. Course options consist of courses in statistics, offered either by the Department of Statistics or by other departments, that have been reviewed and approved by the Executive Committee. Interested students should contact their major department head for information on specific course requirements.

DEGREE REQUIREMENTS

The program offers the M.S. in Statistics with a minor in another department; a joint major program in which the student earns a master's or doctoral degree in the student's sponsoring department along with the M.S. degree in Statistics; and a joint major and minor program in which the student earns a master's or doctoral degree in the student's sponsoring department along with a minor in statistics. The table below presents the minimum number of quarter hours in statistics for each of these alternatives. The student selects courses to satisfy the requirements established by the student's sponsoring department and approved by the Program Executive Committee.

The student's committee must include a faculty member of the Statistics Department, at the rank of Assistant Professor or above. The student's formal examination procedure as established by the sponsoring department must include an appropriate section on statistics. Successful completion of the statistics minor/major is recognized by appropriate documentation on the student's transcript. Students who do not complete all requirements for the statistics major/minor will still receive academic credit for statistics courses they have successfully completed.

Required Quarter

Degree Program: Hours

1. M.S. in statistics, minor outside of statistics 27
2. M.S. outside of statistics, minor in statistics 12
3. M.S. outside of statistics, usual separate statistics requirements for M.S. in statistics both degrees 24
4. Doctorate outside of statistics, minor in statistics 24
5. Doctorate outside of statistics, minor in statistics 36

a. Approved statistics courses from the Department of Statistics and/or other departments.
b. Courses taken for the minor or the master's degree in statistics may fulfill requirements for the doctoral degree. Contact the home department for details.
Kenneth L. Penegar, Dean
Mary Jo Hoover, Associate Dean
Julia P. Hardin, Associate Dean
John A. Sebert, Jr., Associate Dean
N. Douglas Wells, Assistant Dean

THE COLLEGE OF LAW BUILDING

Since 1950 the college has occupied a building especially designed for teaching, study, and research in the law. In the spring of 1971 the college occupied the new wing, doubling the available facilities. The library, the classrooms, and the offices are air-conditioned. Adequate classrooms, courtrooms, seminar rooms, a private office for each full-time faculty member, the well-equipped offices of the Legal Clinic, and a spacious, well-lighted Law Library are contained in this modern building. Stack space for more than 200,000 volumes will permit one of the largest law book collections in the South.

LEGAL CLINIC

The University of Tennessee Legal Clinic was established in 1947. Though the Legal Clinic provides legal assistance to indigent persons, it is designed primarily as a teaching device to correlate theory and practice. It introduces the student, under faculty supervision, to the law in practice through personal contact with clients and their problems. The Legal Clinic functions as a large law office in which the student gains experience in interviewing clients, writing legal letters, investigating and evaluating facts, preparing memoranda of law, preparing cases for trial or adjustment, and briefing cases. Classroom work supplements the handling of actual cases. The student is thus trained in the technique of law practice and the management of a law office. The ethical responsibilities of lawyers and their function as public servants are stressed. Under present rules of the Tennessee Supreme Court, third year students, under the direct supervision of the Legal Clinic staff, are certified to practice before all the courts of Tennessee.

THE LAW LIBRARY

The Law Library contains the official state reports of all states, the complete National Reporter system which covers all states and the federal courts, the Annotated Reports, standard sets of miscellaneous reports, the reports of the Canadian cases and of English cases from the yearbooks to date. In addition to these, there are adequate encyclopedias, digests and dictionaries, standard textbooks, law reviews, and current loose-leaf services, totaling together more than 145,000 cataloged volumes. The library is under the supervision of a law librarian who is trained in law and library science. Law students also have the use of the collections in the University Main Library, which is located across the street from the Law Library; the Undergraduate Library a few blocks away, and other branch libraries.
DEGREE OF DOCTOR OF JURISPRUDENCE

The degree of Doctor of Jurisprudence will be conferred upon candidates who complete, with the required average, six semesters of resident law study and who have 84 semester hours of credit, including all required courses. The required average is 2.0 and that average must be maintained on the work of all six semesters and also for the combined work of the grading periods in which the last 28 hours of credit were earned. Averages are computed on weighted grades. Grades are on a numerical basis from 0.0 to 4.0. A grade of 0.9 or below is a failure.

Eligible law students may receive credit towards the J.D. degree for acceptable performance in up to three (3) upper-level courses taken in other departments at the University of Tennessee. Courses selection and registration are subject to guidelines approved by the law faculty which include the requirement that any such course be acceptable for credit towards a graduate degree in the department offering the course.

DUAL J.D.-MBA DEGREE PROGRAM

The College of Business Administration and the College of Law offer a coordinated dual degree program leading to the conferral of both the Doctor of Jurisprudence and the Master of Business Administration degrees. A student pursuing the dual program is required to take fewer hours of course work than would be required if the two degrees were to be earned separately.

Admissions: Applicants for the J.D.-MBA program must make separate application to, and be competitively and independently accepted by, the College of Law for the J.D. degree and the Graduate School and College of Business Administration for the MBA degree, and by the Dual Degree Committee. Students who have been accepted by both colleges may commence studies in the dual program at the beginning of any term subsequent to matriculation in both colleges provided, however, that dual program students must be registered prior to entry into the last 28 semester hours required for the J.D. degree and the last 24 hours required for the MBA degree.

Curriculum: A dual degree candidate must satisfy the graduation requirements of each college. Dual degree students withdrawing from the dual degree program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as such courses qualify for credit without regard to the dual degree program. For students continuing in the dual degree program, the J.D. and MBA degrees will be awarded upon degree of requirements of both degree programs.

The College of Law will award credit toward the J.D. degree for acceptable performance in a maximum of eight semester hours of approved courses offered by the College of Business Administration. A student shall receive 2 semester hours of credit for each such course successfully completed unless the law faculty specifies otherwise. Two of the 8 semester hours must be earned in Accounting 5810 or a more advanced accounting course. If College of Law credit is given for such accounting course, the dual degree student may not receive College of Law credit for Legal Accounting (Law College Course 8590).

The College of Business Administration will award credit toward the MBA degree for acceptable performance in a maximum of 8 semester hours of approved courses offered by the College of Law.

Except while completing the first-year courses in the College of Law, students are encouraged to maximize the integrative facets of the joint program by taking courses in both colleges each year.

Awarding of Grades: For grade recording purposes in the College of Law for graduate business courses and in the College of Business Administration for law school courses, grades awarded will be converted to either Satisfactory or No Credit and will not be included in the computation of the student's grade average or class standing in the college where such grades are so converted. The College of Law will award a grade of Satisfactory for a graduate business course in which the student has earned a B grade or higher and a No Credit for any lower grade. The College of Business Administration will award a grade of Satisfactory for a College of Law course in which the student has earned a 2.3 grade or higher and a No Credit for any lower grade. Grades earned in courses of college may be used on a regular basis for the J.D. degree and the College of Law will award a grade of Satisfactory for a course on an S/NC basis and for the purpose of the limitation on the number of S/NC courses that a student may take, a non-law course for which credit is received is counted as two-thirds (2/3) of a course. Thus, a student may take three non-law courses if no Law College courses are taken on an S/NC basis, but may take only one non-law course if one Law College course has been taken on an S/NC basis. A student should be aware that if two non-law courses are taken, no Law College courses may be taken on an S/NC basis.

MAINTENANCE OF A SATISFACTORY RECORD

No student will be excluded from the College of Law for academic reasons prior to the completion of two semesters of academic study. A full-time student who fails to achieve an overall average of at least 2.0 upon completion (receipt of a grade) of two semesters of academic study shall be excluded. Such exclusion shall occur regardless of whether the student has obtained permission to vary the first-year full course load.

MAXIMUM COURSE LOAD PER SEMESTER

The maximum course load for a law student is 18 hours in any one semester. During the summer term the maximum course load is 7 hours.

POLICY FOR GRADUATE STUDENTS TAKING LAW COURSES

Law courses are not available for graduate credit; however, a graduate student may be allowed to take up to 6 semester hours of law courses and receive credit toward a degree upon approval of the College of Law and the major chairperson. The graduate student must register for the law course during regular registration at the College of Law requesting an S/NC grade only. If a 2.0 or above is obtained in law course, an S will be recorded on the transcript. If a student earns below a 2.0, an NC will be recorded and the course cannot be used toward meeting degree requirements. Grades for law courses will not be reflected in the cumulative average.

Different rules apply to the student enrolled in the Dual J.D.-MBA Program. Grades must be earned according to the grading system of the respective college. e.g. numerical grades for law courses, letter grades for graduate courses. Refer to page 109 for details.
110 College of Law/Program of instruction

21 for the grading scale acceptable toward meeting degree requirements. Cumulative GPA for law courses only will be carried until graduation. Each course that the graduate and the law cumulative will be shown on the permanent record.

Faculty

Professors:

J. D. Vanderbilt; J. A. Sebert; J. D. Michigan; F. S. LeClercq, LL.B. Duke; C. H. Miller (Emeritus), Chicago; D. S. Jones, J. D. North Carolina; J. J. Gobert, J. D. Duke; R. M. Gray (Emeritus), LL.M. Harvard; J. G. Cook, LL.M. Yale; K. L. Penegar (Dean), LL.M. Yale; N. P. Cohen, the permanent record.

Associate Professors:

G. L. Aandroon, LL.M. Harvard; W. J. Bentema, J. D. Miami; J. D. Jones, J. D. Wyoming; S. D. Kovac, J. D. Michigan; J. D. Cochran, J. D. Yale; R. L. Dessem, J. D. Stanford; R. M. Lloyd, J. D. Michigan; G. L. Anderson, LL.M. Harvard; W. J. Beintema, Associate Professors:

R. Best, M. L. S. Florida; R. J. Hill, J. D. Tennessee.

Instructor:

M. J. Hoover, J. D. Brooklyn Law School.

*Alumni Distinguished Service Professor

PROGRAM OF INSTRUCTION

The J.D. program is designed to give the student an adequate preparation for the practice of law and to provide a venue for testing identifiable legal problems. S/NC only.

REQUIRED COURSES

8010 Civil Procedure I (3) Introductory course; binding effect of judgments; selecting proper court—jurisdiction and venue; administering applicable law, federal and state practice.

8020 Contracts I (3) Basic agreement process and legal protection afforded contracts. Problems of offer and acceptance, interpretation, illegality, and statute of limitations.

8030 Contracts II (3) Continuation of Contracts I. Remedies, conditions, impossibility and frustration, third party beneficiaries, assignment and delegation, discharge.

8040 Criminal Law (3) Substantive aspects of criminal law. General principles applicable to all criminal conduct, specific analysis of particular crimes; substantive defenses to crimes, including insanity, intoxication, mistake, necessity, legal self-defense, and duress.

8070 Legal Process (2) Court structure; case analysis, case synthesis, and use of cases to predict and influence judicial decisions; legislative process, statutory interpretation, influence of judge as policy-maker; adversary system and lawyer's roles. Use of legal authority in periodic written exercises.

8110 Legal Bibliography and Research (1) Instruction in legal methodology, citation form, and research methodologies, including computerized research. Identification and location of authorities required to prepare a law of LEXICON relating to an identifiable legal problem. S/NC only.

8111 Legal Writing and Advocacy (2) Legal writing exercises, effective communication of ideas. Preparation of brief and oral argument. S/NC only.

8130 Property I (3) Freesthold estates, future interests, concurrent ownership, leases, real estate contract and deed; principles of personal property.

8140 Property II (3) Recording system, title assurance, easements, nuisance, lateral support, water rights, zoning, and eminent domain.

8180 Torts I (3) Intended interference with the person, assault and battery, defamation, negligence, affirmative duties, immunities, actual causation, and contributory causes.

8190 Torts II (3) Negligence, result within the risk, or proximate causation. Assumption of risk and contributory fault; interference with property, trespass, conversion, privilege; strict liability, liability of suppliers and contractors, misrepresentation; defamation; unjustifiable litigation; privacy; interference with contractual relations.

8300 Constitutional Law (3) Judicial review, limitations on judicial power, national legislative power, regulation of commerce, power to tax and spend; other sources of national power, state power to regulate and tax, intergovernmental immunities; substantive due process, congressional assignment of civil rights.

8680 Legal Profession (2) Role of lawyer in society and within the profession; organization and operation of a law office; professional ethics; relationships between the lawyer and the client, lawyer-client relationship, advocacy and its limitations, fees, and disciplinary procedures.

8860 Income Tax I (4) What is it; when is it; how is it taxed (capital gains and losses, dividends, capital gains tax); deductions and credits; rates (corporate, estate, and trust).

8940 Civil Procedure II (3) Pleading, joinder of claims and parties; discovery, trials, verdicts, judgments and appeals; emphasis of Federal Rules of Civil Procedure.

PERSPECTIVE COURSE REQUIREMENT

One course among the following is required for graduation: American Legal History; Comparative Law; Criminal Law Theory; Environmental Law; Constitutional Law; Jurisprudence; Law and Economics; Law Language, and Ethics; Legal Imagination; and Tax Theory.

WRITING REQUIREMENT

One upper-level course in which a substantial legal problem is identified and the student is supervised in writing an essay. S/NC only.

ELECTIVE COURSES

8015 Comparative Law (3) General introduction to civil law systems of France and Germany, focusing on legal institutions, methodology and aspects of law of obligations and commercial law.

8050 American Legal History (3) Historical development of law, legal institutions, legal professions, and legal education from colonial times to present; historical relationship of legal system to society.

8055 Criminal Law Theory (3) Theoretical foundations of criminal law, including an examination of the concepts of justice and morality and pertinent materials in physical and behavioral sciences.

8061 Criminal Procedure I (3) Police practices and rights of persons charged with crimes: arrest, search and seizure, identification, interrogation, entrapment, electronic eavesdropping, right to counsel, and jury trial.

8062 Criminal Procedure II (3) Pre- and post-trial procedures in a criminal case: bail, preliminary hearing, plea bargaining, procedural discretion, discovery, speedy trial, plea bargaining, and post-conviction relief.

1215 Admiralty (2) Admiralty courts and jurisdiction; death and injury to persons; special provisions concerning various maritime workers; carriage of goods by ships; principles governing collisions and liability.

1310 Trial Practice (3) Criminal and civil litigation: trial procedures and preparation; basic trial strategy; professional responsibility, fact investigation, witness preparation; discovery and presentation of evidence, selection and instruction of juries, opening and closing arguments.

8200 Administrative Law (3) Administrative agencies and process; delegation and interpretation of powers; investigatory and rule-making procedures and requirements; adjudicative procedures, evidence, findings, stare decisis, and res judicata; exhaustion of remedies, opening, and standing review; proceedings and scope of review.

8230 Law and Current Problems (2-3)

8260 Bills and Notes (2) Negotiable instruments, negotiable certificates of deposit, negotiable orders of withdrawal and deposits, negotiable instruments, and negotiable offenses; defenses; liability of parties; discharge; letters of credit; Arts. 3, 4, and 5 of Uniform Commercial Code.

8280 Conflict of Laws (3) Jurisdiction, foreign judgments, choice of law, constitutional limitations, reversion, and classification.

8310 Constitutional Law II (3) Freedom of expression, association and religion; Fourteenth Amendment rights excluding rights of criminal accused, including discipline imposed as to race, sex, etc., right to franchise and apportionment; concept of state action in matters of civil rights.

8340 Debtor-Creditor Law (3) Enforcement of judgments; bankruptcy and its alternatives for the businessman; emphasis on federal bankruptcy statutes.

8360 Family Law (3) Survey of laws affecting formal and informal family relationships: premarital agreements, antenuptial contracts, creation of common law and formal marriage, legal effects of marriage, support obligations within family, legal separation, annulment, divorce, alimony, property settlements, child custody, child support, adoption, abortion, and illegitimacy.

8420 Evidence (4) Rules regulating introduction and exclusion of oral, written, and demonstrative evidence, including relevancy, competency, impeachment, hearsay, privilege, judicial notice, presumptions, burden of proof.

8460 Federal Courts (3) Jurisdiction of federal courts and conflicts between federal and state judicial systems, including nature of judicial power, federal questions, diversity, removal, jurisdictional amount, choice of state or federal law, habeas corpus, abstention, qualifying state proceedings, appellate jurisdiction, joinder of parties and claims.


8500 Future Interests (3) Law of future interests, including reversionary, remainder, possibilities of reverter and rights of entry, executory interests, construction of limitations, and rule against perpetuities.

8510 Government Contracts (3) Principles relating to government procurement, both federal and state; award, performance, and termination of contracts; administrative settlement of disputes arising under government contracts. Prereq: 8260.

8525 International Business Transactions (3) Legal status of persons abroad, acquisition and use of prop-
ergy within a foreign country, doing business abroad as a foreign corporation, engaging in business within a foreign country, expropriation or annulment of contracts or concessions.

8530 Public International Law (3) International agreements, organizations, recognition of states, nationality, territory, jurisdiction and immunities, claims, expropriation, force and war.


8540 Labor Law (4) Evaluation of labor relations laws, rights of self-organization; employer and union unfair labor practices; strikes, boycotts and picketing, collective bargaining; public employee labor relations; internal union affairs; individual rights in labor relations; employment discrimination; federalism and preemption; unions and antitrust laws.

8560 Law, Language, and Ethics (3) Intermediate level jurisprudence-type course; law as the mind's attempt to defend, direct, and administer human activity; exploration of ethical values underlying formal legal reasoning and statement; analysis of judicial reasoning and legal concepts through methods of epistemology.

8565 Law and Economics (3) Relationship between legal and economic thought, use of economic in legal decision making and legal criticism.

8590 Legal Accounting (2) Accounting problems and techniques, use and understanding of accounting information.

8650 Copyright, Patent and Trademark (3) Protection for intellectual property under federal and state law; patents, trademarks and trade names, trade secrets, copyright considerations, international aspects.

8655 Legal Imagination (3) Systematic study of literature and its application to accurate, fluent, and creative legal composition.

8670 Legal Writing (1) By arrangement. Completion of a potentially publishable Casenote or Comment or Perspective for the Tennessee Law Review or participation as a member of a faculty supervised moot court competition. S/N only.

8680 Legislation (3) Interpretation and drafting of statutes, legislative process, and legislative power; judicial views on legislative process subjected to critical comparison with realities of legislative processes and applicable constitutional principles.

8690 Modern Land Use Law (2) Land use planning, nuisance, zoning, eminent domain.

8700 Local Government (3) Distribution of power between state and local governmental units; sources of authority for limitations on local government operations; creation of local governmental units and determination of their boundaries; problems represented by fragmentation of local government; sources of authority for limitations on local government operations; creation of local governmental units and determination of their boundaries; problems represented by fragmentation of local government; sources of authority for limitations on local government operations; creation of local governmental units and determination of their boundaries; problems represented by fragmentation of local government; sources of authority for limitations on local government operations; creation of local governmental units and determination of their boundaries; problems represented by fragmentation of local government; sources of authority for limitations on local government operations; creation of local governmental units and determination of their boundaries; problems represented by fragmentation of local government; sources of authority for limitations on local government operations; creation of local governmental units and determination of their boundaries; problems represented by fragmentation of local government; sources of authority for limitations on local government operations; creation of local governmental units and determination of their boundaries; problems represented by fragmentation of local government; sources of authority for limitations on local government operations; creation of local governmental units and determination of their boundaries; problems represented by fragmentation of local government; sources of authority for limitations on local government operations; creation of local governmental units and determination of their boundaries; problems represented by fragmentation of local government; sources of authority for limitations on local government operations; creation of local governmental units and determination of their boundaries; problems represented by fragmentation of local government; sources of authority for limitations on local government operations; creation of local governmental units and determination of their boundaries; problems represented by fragmentation of local government; sources of authority for limitations on local government operations; creation of local governmental units and determination of their boundaries; problems represented by fragmentation of local government; sources of authority for limitations on local government operations; creation of local governmental units and determination of their boundaries; problems represented by fragmentation of local

8755 Selected Problems in Remedies (3) Course content varies. Topics: civil rights injunctions, remedies in complex litigation (class actions and/or derivative suits), procedures in restitution. Prereq: 8750 or consent of instructor.

8760 Advanced Business Associations (2) Selected topics. Prereq: 8740.

8770 Products Liability (3) Negligence of manufacturer; product liability of retailer and other suppliers; detectiveness and causation; disclosures and contributory fault.

8800 Sales and Secured Transactions (4) Art. 2 (Sales) and Art. 7 (Documents of Title) of the Uniform Commercial Code; secured transactions, perfection and perfection problems; Art. 9 (Security Interests in Personal Property) of the Uniform Commercial Code.

8815 Discrimination and the Law (3) Comparison of race, sex and other invidious discriminatory practices as they affect political participation, education, employment, housing and other social and economic activities; emphasis on legislative enforcement of post-Civil War Amendments and state and federal civil rights Amendments; study of relevant court decisions and enforcement of relevant legislation.
8870 Business Planning Seminar (2) Selected problems on corporate and tax aspects of business planning and transactions. Prereq: 8850, 8862, and 8749.

8875 Commercial Law Seminar (2) Content varies. Planning seminar to execute a complex commercial transaction or selected problems in commercial transactions; major research paper. Prereq: 8850.

8890 Environmental Protection Seminar (2) Problems of litigating in defense of environment and mobilizing public and private efforts in defense of environment. Problems of proving environmental impact of selected projects, interpretation and evaluation of scientific data, use of expert witnesses. Special environmental concerns of region, e.g., TVA operations, strip mining, forest management, wildlife preserves. Team-teaching and selected experts. Prereq: 8480.

8910 Administrative Law Seminar (2) Principles of administrative law. Discretion, choice of adjudication or rulemaking to develop administrative policy; consistency in administrative action.

8930 Consumer Protection Seminar (2) Selected problems in consumer protection.

8935 Law and Medicine Seminar (2) Medical profession's involvement in judicial process: medical malpractice and alternatives to fault-based liability; responsibilities for disposition and care of dead bodies and legal principles governing organ transplantation; expert medical proof and testimony; medico-legal aspects of euthanasia; legal import of medical profession's various canons of ethics.

8955 Trade Regulation Seminar (2) Antitrust laws and laws applicable to regulated industries.

8960 Office Practice Seminar (2) Techniques of law office management, methods and practice: techniques in preparation of various legal instruments, office accounting, interviewing and counseling, management of personnel.

8995 Land Acquisition & Development Seminar (2) Alternative business forms and major documents (notes, deeds, prospectus, etc.) necessary to accomplish acquisition or development of large pieces of raw land prepared and presented for seminar discussion. Prereq: 8990.

COURSE OFFERINGS SUBJECT TO CHANGE

The necessity of adjustments to accommodate changing conditions may dictate modifications in the course offerings and other features of the program described above. Accordingly, the college reserves the right to make such variation in its program as circumstances may require. Prospective students who are interested in the precise course offerings at a given time or who desire other special information should make inquiry in advance.

It is necessary to offer some courses and seminars only on an every-other-year basis. Choice is based on subject matter and past patterns of student enrollment.
The College of Liberal Arts offers programs leading to eight advanced degrees. See page 9 for degrees and majors.

General Information

FOREIGN STUDY COURSES

Foreign study courses offered in some departments of the College provide an opportunity to undertake independent study outside the United States. Prior to departure the student must have a plan of study approved by the department head and a supervising faculty member of the department concerned. Credit will be given only upon fulfilling all requirements set by the department and may vary from 1-12 hours. The maximum credit which may be applied toward a degree in the College is established in each individual case by the department in which the student is working.

OFF-CAMPUS STUDY

Recognizing that learning is not restricted to formal classroom situations, the College provides for students to earn credit toward graduation for approved off-campus study. Such study may be undertaken only with prior approval of the faculty member and the department concerned. It may include certain kinds of work experiences, community involvement, working in political campaigns, etc. Credit per quarter will vary from 1-12 hours. The maximum credit which may be applied toward a degree in the College is established in each individual case by the department in which the student is working.

INDEPENDENT STUDY

Certain educational goals may best be met through independent study done by an individual under the direction of a faculty member. Students who wish to do such independent work should obtain the approval of the faculty members and the departments concerned prior to embarking upon their study. Credit per quarter will vary from 1-12 hours. The maximum credit which may be applied toward a degree in the College is established in each individual case by the department in which the student is working.

Departments of Instruction

Anthropology

MAJOR

DEGREES

Anthropology

M.A., Ph.D.

Professors:
W. M. Bass (Head), Ph.D. Pennsylvania; C. H. Faulkner, Ph.D. Indiana; R. L. Jantz, Ph.D. Kansas; P. W. Parmalee, Ph.D. Texas A & M; M. C. Wheeler, Ph.D. Yale (part-time).

Associate Professors:

Assistant Professors:
B. J. Howell, Ph.D. Kentucky; J. F. Simek, Ph.D. SUNY-Binghamton; P. S. Willey, Ph.D. Tennessee.

Instructor:
M. A. Bass (part-time), Ph.D. Kansas State.

Research Associate Professor:

Research Assistant Professors:
M. O. Smith, Ph.D. Tennessee; S. D. Tardiff, Ph.D. Michigan State.

The Department of Anthropology offers the Master of Arts and the Doctor of Philosophy degrees with concentrations in physical anthropology, cultural anthropology, archaeology, zooarchaeology, and folk culture. Additional information may be obtained from the Anthropology Department.

THE MASTER'S PROGRAM

Requirements for the M.A. degree include:

1. For admission, a letter of intent by applicant and submission of three letters of recommendation.
2. A minimum of 45 quarter hours for graduate credit. Thirty-six of these 45 hours must be in anthropology; 9 hours may be taken in closely related disciplines; at least two-thirds of all credit must be at the 5000 level or above.
3. A minimum of three quarters of residence at UK.
4. Introductory statistics course to be taken before taking the Graduate Evaluation Examination.
5. Graduate Evaluation Examination taken during the quarter the student is enrolled in her/his 33rd quarter hour or the first time the examination is given after completing the 33rd hour. The examination is given each year in January.

THE DOCTORAL PROGRAM

Requirements for the Ph.D. degree include:

1. Admission to the program through departmental acceptance of a previously earned M.A. degree in anthropology. Students with an M.A. in a field other than anthropology may be admitted by completing other requirements which are described in the departmental brochure.
2. Formation of an advisory committee, and in consultation with that committee, establishment of a program of study, including delineation of field(s) of competence.
3. No minimum credit hour requirement. Students should plan to devote no fewer than four years beyond the B.A. to attain the Ph.D.
4. Foreign language(s), statistics, or some other skill to be determined by the student's committee.
5. Written and oral comprehensive examinations.
6. Successful completion of the dissertation and final oral examination.

3070 Genetics and Society (3) (Same as Botany 3070)
3410 Principles of Cultural Anthropology (3) Basic concepts and objectives in study of culture. Range of
cultural phenomena and approaches to its study. Recommended prereq: 2530. A

4250 Medical Anthropology: Lecture (3) A survey of medical anthropology. Emphasis on Western and non-Western cultural aspects of health, disease, treatment, death, and related concepts. Focus on analyses and descriptions of anthropological fieldwork. A

4300 Readings in Anthropology (1-9) Intensive reading; problem oriented. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A

4240 Field Work in Anthropology (3-9) Practicum work surveying, excavating, processing, and analyzing of data; intensive reading. Prereq: 2510-20-30 and consent of instructor. May be repeated. Maximum 9 hrs. A

4400 Cultural Ecology (3) Survey of concepts and methods in studying dynamic interaction between cultures and their environments. Topics include ecological theory, methods of analysis, and application from selected case studies. Prereq: 2520, 2530, 3410 or consent of instructor. A

4420 Dynamics of Culture (3) Culture change, innovation, diffusion and acculturation: cultural continuity and stability. Prereq: 2530 or consent of instructor. A

4440 Urban Anthropology (3) Survey of theoretical and methodological issues anthropologists encounter researching cross-cultural urban settlements. Focus on anthropological perspectives on urban problems and planning. Prereq: 3450 or consent of instructor. A

4480 Current Trends in Anthropology (3) Analytical integrative review in symposium of the current debates, research directions, theories, fieldwork methods, and general assumptions of the four subfields of anthropology: archaeology, physical anthropology, linguistics, and cultural anthropology. Sp A

5560 Indian Studies of the Southeastern United States (3) Survey of southeastern Indian cultures; emphasis on aboriginal adjustment to environment; lifeways of Southeastern Amerindian groups prior to Euro-American contact. Prereq: 2530, 3540 or consent of instructor W

5460 Cherokee Ethnology (3) Intensive survey of ideology and material aspects of Cherokee culture existing at time of first European contact. Prereq: 2520 or consent of instructor W

5450 Indians of the Southeastern United States (3) Survey of Southeastern Indian cultures; emphasis on aboriginal adjustment to environment; lifeways of Southeastern Amerindian groups prior to Euro-American contact. Prereq: 2530, 3540 or consent of instructor W

5400 Method and Theory in American Archaeology (3) Historical development of New World archaeology with emphasis on theory and field techniques. Prereq: 2520 or consent of instructor. Sp

5410 Ethnographic Research Techniques (3) Methodological and technical aspects of anthropological fieldwork. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A

5420 Anthropological Theory (3) Theoretical developments in anthropology; fieldwork methods, and general assumptions of the four subfields of anthropology: archaeology, physical anthropology, linguistics, and cultural anthropology. Sp A

5220 Nutritional Anthropology (3) Anthropological contributions to study of food-related cultural and biological variability in present and past populations. Prereq: 2510, 2520, 2530 and consent of instructor. Recommended: Basic nutrition course.

5340 Fieldwork in Anthropology (3-9) Practicum work surveying, excavating, processing, and analyzing of data; intensive reading. Prereq: 9 hours of introductory anthroponomy and consent of instructor. May be repeated. Maximum 9 hrs. A

5430 Psychological Anthropology (3) Analysis of relationship between individual, society, and culture. Emphasis on psychological theories of personality, language, and cognition. Prereq: Consent of instructor.

5300 Sociocultural Theory (3) Theoretical development in cultural anthropology: contributions of leading anthropologists. Recommended prerequisite 4310.

5240 Anthropological Theory (3) Theoretical development in cultural anthropology: contributions of leading anthropologists. Recommended prerequisite 4310.

5140 Laboratory Studies of the Vertebrate Skeleton (3) Examination and comparison of skeletons of major groups of fish, amphibians, reptiles, birds, mammals. Oriented toward identification of archaeologically derived faunas. May be repeated. Maximum 8 hrs. Sp, A

5190 Laboratory Study of the Mollusca (4) Examination and identification of terrestrial and freshwater mollusks of eastern U.S. Emphasis on living and archaeologically derived pelecypods. Prereq: 4640. 1 hr and 3 labs. Sp, A

5160 Seminar in Archaeology (3-9) Theoretical and practical issues central to contemporary archaeology. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5180 History of Thought in American Archaeology (3) Intensive review of continuity and change in concepts and methodologies; contributions of influential archaeologists. Prereq: 2520, 3610 and consent of instructor.

5000 Thesis (1-15) P/NP only. E

5010 Graduate Research (1-9) Independent investigation of special problems in anthropology. May be repeated. Maximum 18 hrs. E

5010 Seminar in Cultural Anthropology (3-9)
5900 Dental Anthropology (3) Dental anatomy, theories of dental evolution, genetic and environmental influences controlling dental morphology, comparative primate dental morphology, dental trait analyses, significance of dentition for skeletal aging, and dental casting. Prereq: 3900. A

5910 Measurement of Man (3) Techniques of measuring and describing skeletal material and human subject with emphasis upon practical application to growth, nutrition, and human engineering. Prereq: Consent of instructor. A


5940 Skeletal Biology of Early Human Population (3) Practical and theoretical approaches to analysis of prehistoric human skeletal populations. Demography, vital statistics, pathology, nutrition, and mechanisms of biological relationships as they relate to population as adaptive unit. Prereq: 3900. F.

5960 Dermatoglyphics (3) Methods of dermatoglyphic analysis; genetics and population variation of various dermatoglyphic elements; forensic applications; relationships to various genetic and chromosomal abnormalities. Prereq: Consent of instructor.

5980 Neanderthal Man and Human Evolution (3) Morphology, distribution, and evolutionary relationships of Neanderthals. Prereq: 4970 or consent of instructor. W.

5990 Human Variation (3) Nature of human biological variation with emphasis on microevolutionary processes responsible for establishing and maintaining variation and relationships of variation to population structure. Prereq: 3990 or consent of instructor. A

6000 Doctoral Research and Dissertation (3-18) Pr NP only. E

6010 Advanced Graduate Research (1-6) Independent study of special problems in anthropology by advanced graduate students. May be repeated. Maximum 18 hrs. Only 3 hrs may count toward 6000-level requirement.

6200 Seminar in Nutritional Anthropology (3) Analytical review of major theoretical viewpoints in nutritional anthropology. Prereq: 5220 and consent of instructor.

6410-30 Seminar in Cultural Anthropology (3, 3) Seminar study. May be repeated. Maximum 9 hrs.

6910 Selected Topics in Physical Anthropology (3) May be repeated. Maximum 9 hrs.

6970 Seminar in Human Paleontology (3) Prereq: 4970 or consent of instructor.

Archaeology—Greek and Roman

See Classics

Art

MAJOR

DEGREES

Art

M.F.A.

Professors:


Associate Professors:

P. M. Brakke, M.F.A. Yale; R. H. Daehnert, M.F.A.
ulty and receive permission to continue in the program.

2. Second year evaluation: With completion of all course work the student must present work for evaluation by the faculty and receive permission to register for Projects in Lieu of Thesis (Art 5999).

3. If, in a review by the student's major area faculty, the student's progress is deemed insufficient, the faculty may recommend the following: a pause in which work is continued without advancement toward the degree; probation with specific goals set for a specific time; or termination.

GRADUATE MINOR IN THE HISTORY OF ART

A graduate minor in Art History may be arranged with the consent of the student's committee, the instructors involved, and the Graduate School. Prerequisite is an undergraduate Art History minor, or its equivalent, and reading knowledge of French, German, or Italian, unless waived by the art history faculty.

3516 Typography (4) Theories and techniques of type-setting and printing as fine art medium. Creative problem solving using typography and printing presses. May be repeated. Maximum 12 hrs.

3517 Airbrush (4) Techniques of airbrush. Emphasis on skill and creative applications. For art majors only.

3715 Early Italian Renaissance Art: 1300-1450 (4) Development and exploration of naturalism. Revival of antiquity and development of theories of perspective in Early Renaissance. Duccio, Giotto, Masaccio, Donatello, Botticelli. A

3716 The Art of Italy, 1475-1575 (4) Leonardo da Vinci, Michelangelo, Titian, Raphael, Pontormo and Giorgione. F

3725 Art of Southern Europe and New World, 1550-1830 (4) Tintoretto, El Greco, Caravaggio, Zurburan, Velazquez. Regionalism and commercialization of Iberia and Latin America. Sp

3726 The Art of Northern Europe, 1550-1675 (4) Concentrated study of Bruegel, Rubens, Rembrandt; Georges de la Tour, Vermeer, Poussin and Hals. W

3735 History of Nineteenth-Century Painting in Europe and America (4) Emphasis on the schools of Impressionism, Post-impressionism, Realism, Romanticism, Friedrich, Constable, Turner, Corot and Barbizon landscapists, Hudson River Group, pre-Raphaelite Brotherhood, Manet, Courbet, Impressionism, Eakins, Homer, Seurat through Cezanne. W

3736 History of Twentieth-Century Painting in Europe and America (4) Fauvism, Die Brucke, Cubism, Der Blaue Reiter, Futurism, Dada and Surrealism, geometric abstraction, social-commentary painting. Abstract Expressionism in the U.S.A. and parallels in Europe; Pop, Op, Minimal, and Concept Art. F


3746 History of Modern Sculpture in Europe and America (4) From 1800 to 1900; Neoclassicism to Rodin. From 1900 to present: emphasis on Cubism, Constructivism, Expressionism, Assemblage, Primary Forms, Environments, and Earthworks. Sp

3765 History of North American Art (4) Survey of landmarks in painting, architecture, sculpture, and design from prehistory to 1900. F

3766 History of Twentieth-Century American Art (4) Analysis of developments in architecture, painting, sculpture, and design from 1900. W

3767 Nineteenth-Century American Painting (4) From West and Copley to the Ash Can School. The Eight. F

3755 Art of India (4) History of Indian art with consideration of art of Central Asia and Southeast Asia. Sp

3776 Chinese Art (4) F

3777 Japanese Art (4) F

3811 Museology (4) Concepts, practices and historical development of museums of art, anthropology and science. (Same as Anthropology 3811.)


4006 Special Topics (2-4) Student- or instructor-initiated course offered at convenience of department. Prereg. Determined by department. May be repeated. Maximum 16 hrs.


4016 Special Topics in Drawing (3) Student- or instructor-initiated course offered at convenience of department. Prereg. Determined by department. May be repeated. Maximum 16 hrs.


4120 Special Topics in Painting (3) Student- or instructor-initiated course offered at convenience of department. Does not substitute for basic program. Prereg. Determined by department. May be repeated. Maximum 12 hrs.


4256 Special Topics in Fiber and Fabrics (3) Student- or instructor-initiated course to be offered at convenience of department. Prereg. Determined by department. May be repeated. Maximum 20 hrs.

4270 Fabric: Advanced Projects (4-5) Prereg: 8 hrs of 2370 or consent of instructor. Maximum 12 hrs.

4275 Fiber: Advanced Projects (4-6) Prereg: 8 hrs of 3275 or consent of instructor. May be repeated. Maximum 12 hrs.


4406 Special Topics in Sculpture (3) Student- or instructor-initiated course offered at convenience of department. Prereg. Determined by department. May be repeated. Maximum 12 hrs.

4415 Advanced Sculpture IV (4-6) Individual development of sculptural problems and techniques. Prereg. Consent of instructor. May be repeated. Maximum 18 hrs.

4470 Advanced Wood Sculpture (4-6) Application of laminations, carving, and jointing techniques in design and construction of contemporary forms. Prereg: 2450 or consent of instructor. May be repeated. Maximum 18 hrs.

4502 Graphic Design/Illustration Practicum (1-15) Practical work experience in design or illustration field only by prearrangement with department. Prereg. Senior or graduate standing and consent of instructor. May be repeated. Maximum 16 hrs.

4505 Advanced Graphic Design (4) Advanced projects in conceptual and applied design for printed materials; publications, posters, advertisements. Prereg: 3545.

4506 Special Topics in Graphic Design/Illustration (3) Student- or instructor-initiated course offered at convenience of department. Prereg. Determined by department. May be repeated. Maximum 12 hrs.

4509 Product Illustration (4) Advanced media, techniques, styles and concepts as applied to illustration of products for printed reproduction. Prereg: 3529 or consent of instructor.


4516 Portfolio and Exhibition Techniques (4) Application of design principles to promotion, construction, display and evaluation for two- and three-dimensional artists. Prereg: Senior or graduate standing or consent of instructor.

4519 Editorial Illustration (4) Advanced study of conceptual approaches in editorial illustration for printed reproduction. Prereg: 4505 or consent of instructor.

4506 Special Topics in Printmaking (3) Student- or instructor-initiated course offered at convenience of department. Prereg. Determined by department. May be repeated. Maximum 16 hrs.

4515 Intaglio IV (4-6) Photographic, collage techniques, combine printing with other print media. May be repeated. Prereg: 3529 or consent of instructor.

4516 Screen Printing IV (4-6) Extensive use of aluminum plates, color combine printing, photographic techniques. May be repeated. Maximum 18 hrs. F, W, Sp

4517 Screen Printing IV (4-6) Extensive use of aluminum plates, color combine printing, photographic techniques. May be repeated. Maximum 18 hrs. F, W, Sp


4720 History of Printmaking (4) Survey of prints from fifteenth century to present. Twentieth century in Europe and the U.S. Prereg: 1815, 1825.

4811 Museum Internship (1-16) Prereg: 8 hrs from 3811-21-31 and consent of instructor. May be repeated. Maximum 16 hrs.

4855 Studies in Art History (2) Concentration in selected area. Prereg: 18 hrs of art history and consent of instructor. May be repeated. Maximum 6 hrs.

4905 Advanced Photography (4-6) Individual development of photographic problems and techniques. Prereg: 3805, 3915, 3925. May be repeated. Maximum 18 hrs.

4906 Special Topics in Photography (3) Student- or instructor-initiated course offered at convenience of department. Prereg. Consent of department. May be repeated. Maximum 12 hrs.

4956 Special Topics in Ceramics (2) Student- or instructor-initiated course offered at convenience of department. Prereg. Determined by department. May be repeated. Maximum 12 hrs.


4968 Honors Ceramics IV: Advanced Projects (4-6) Prereg: 3900, 3960, and consent of instructor. May be repeated. Maximum 18 hrs.

4975 History of Ceramics Seminar (4) Historical and contemporary ceramics: clay sculpture, architecture, and pottery. Oriental, Ancient Greek, Pre-Columbian, and American ceramics. May not be used toward art history requirements. Prereg: 2950, 2960, and 2970.

5000 Thesis (1-15) P/NP only. E
Studies in Modern Western Art (4) Selected topics in 19th and 20th century western art. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 8 hrs.

Studies in Modern American Art (4) Selected topics in 19th and 20th century American art. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 8 hrs.

Studies in Italian Renaissance Art (4) Art and architecture major artists and works from either southern Italy or northern Europe. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 8 hrs.

Studies in Baroque Art (4) 17th century art and architecture major artists and works from either southern Italy or northern Europe. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 8 hrs.

Studies in Modern Western Art (4) Selected topics in 19th and 20th century western art. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 8 hrs.

Studies in Italian Renaissance Art (4) Art and architecture major artists and works from either southern Italy or northern Europe. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 8 hrs.

Studies in Baroque Art (4) 17th century art and architecture major artists and works from either southern Italy or northern Europe. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 8 hrs.

Studies in Baroque Art (4) 17th century art and architecture major artists and works from either southern Italy or northern Europe. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 8 hrs.

Studies in Baroque Art (4) 17th century art and architecture major artists and works from either southern Italy or northern Europe. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 8 hrs.
individuals to identify and independently study important questions concerning the human act of oral and aural communication. Students will then be able to transmit the accumulated knowledge in the area of:

1. Basic speech, hearing and language processes;
2. Speech, hearing and language disorders;
3. Related disciplines providing insight into human communication processes;
4. Technical skills in instrumentation and experimental design which enable the student to investigate problems pertaining to speech and hearing processes.

The program will normally consist of three or more calendar years of graduate study beyond the Master's degree with the first year being devoted primarily to formal course work and the last year to full-time research culminating in the doctoral dissertation.

Specific programs of study will be determined by the student in consultation with his/her faculty committee. In addition to the general Graduate School requirements, specific requirements for the degree of Doctor of Philosophy in Speech and Hearing Science will include:

1. Successful completion of course work in the study of one or more research tools, or other specific scientific methodological vehicles pertinent to the research interests of the candidate. The choice of research tools is subject to departmental approval.
2. A minimum of 9 quarter hours of graduate credit obtained in course work in a cognate field outside the Department of Audiology and Speech Pathology. These hours are in addition to those required in item 1 above.
3. Sufficient course work within the department but outside the area of specialization to give a broad foundation and understanding.
4. A comprehensive examination to demonstrate a general knowledge of the basis of audiology, speech and language pathology, and speech and hearing science; advanced knowledge of the specifics of the area of specialization.
5. Research and dissertation to give at least 36 hours of graduate credit (6000 level).
6. A final oral examination.

4040 Appraisal of Speech and Language Disorders (4) Diagnostic procedures for children and adults with speech and language problems including observation and practice with diagnostic tests. Prereq: 3200, 4330, or consent of instructor. (Same as Special Education 4040.) F, Sp

4070 Free Association (4) Oral and written free association as process for diagnosing and treating communication disorders. Includes didactic self-analysis. W

4250 Introduction to the Psychology and Education of the Hearing Impaired (3) (Same as Special Education 4250.)

4310 Stuttering (3) Nature and treatment. Review and integration of various theories. Prereq: 3040 or consent of instructor. (Same as Special Education 4310.) F, Su

4320 Introduction to Clinical Practice in Speech Pathology (3) Prereq: 3040, 3050, 3310, and consent of instructor. (Same as Special Education 4320.)

4330 Clinical Practice in Speech Pathology (1-6) Prereq: 4320 and consent of instructor. (Same as Special Education 4330.) Audiology and Speech Pathology is the primary department. E

4340 Clinical Practice in Speech Pathology (1-6) Prereq: 4040, 4330 and consent of instructor. (Same as Special Education 4340). May be repeated. Maximum 9 hrs. E

4400 Voice Disorders (4) Etiology, diagnosis, and treatment of organic and functional voice disorders. Prereq: 3040, 3065, or consent of instructor. (Same as Special Education 4400.)

4450 Clinical Practice in Audiology (1-6) Prereq: 4720 and 4930. E

4480 Clinical Practice in Audiology (1-6) Prereq: 4450, 4720 and 4930. E

4470 Clinical Practice in Audiology (1-6) Prereq: 4460, 4720, 4930. May be repeated. Maximum 9 hrs. E

4520 Speech Pathology (3) Independent study of special problems in speech pathology. Prereq: Consent of instructor. E

4550 Problems in Speech Pathology (1-6) Prereq: Consent of instructor. E

4560 Problems in Audiology (1-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

4610 Introduction to Language Pathology in Children (4) Nature and treatment of language retardation. Observation in language clinic is available. Prereq: 3040, 3200, or consent of instructor. F, Sp

4620 Birth Defect Syndromes and Language Retardation (3) Examination of research literature relevant to birth defects and language retardation including clinical, educational and socioemotional implications of such disorders. Prereq: 4610 or consent of instructor. Sp

4630 Practical Applications of Language Habilitation Techniques (3) Discussion and demonstration of various methods and procedures used in treating language retarded children. Prereq: 4610 or consent of instructor. W

4640 Parent Participation in Language Habilitation Programs (3) Nature of counseling and educational relationships with parents of exceptional children including emotional support for families, behavior management strategies, home training methods. Prereq: 4610 or consent of instructor. Sp

4650 Speech and Language of the Culturally Different Child (3) Discussion of speech and language differences of children of various minority groups, of different ethnic and class membership and from different geographic regions; their causes, and their effects upon educational programs. F, W, Su

4660 Topics in Language Retardation and its Habilitation (3) Lectures on selected topics by representatives of such fields as special education, early childhood education, educational psychology, genetics, and psychology. Prereq: 4610 or consent of instructor. Su

4720 Audiology II (4) Basic principles of clinical audiometry; pure-tone, speech, masking and overview of special auditory tests. Prereq: 3710. (Same as Special Education 4720.) W, Su


4930 Aural Rehabilitation: Speechreading and Auditory Training (3) Rehabilitation of acoustically impaired by maximizing use of residual hearing and utilizing speechreading as receptive communicative process. Prereq: 4720. (Same as Special Education 4930.) E

5000 Thesis (1-15) P/NP only. E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May be used toward degree requirements. May be repeated. S/N/NC only. E

5005 Thesis Equivalent Research (1-9) Prereq: 5110 and M.A. in Speech Pathology or Audiology or equivalent. May be repeated. Maximum 9 hrs. E

5040 Advanced Clinical Practice in Audiology Study and Practice (1-6) Prereq: 4720 and 4930. May be repeated. Maximum 12 hrs. (Same as Special Education 5040.) E

5041 Advanced Clinical Practice in Audiology: Off-Campus Sites (1-6) Prereq: Consent of instructor. E

5045 Practicum in Hearing Aid Orientation and Communication Counseling (1-6) Practical exposure to counseling hard of hearing and family members concerning use and expectations of hearing aids, suggestions for better use of communication skills. Prereq: 4720, 4930, and consent of instructor. May be repeated. Maximum 9 hrs. E

5050 Practicum in Verbo-Tonal Habilitation (1-6) Prereq: 4940, 5950, or consent of instructor. Prereq: Consent of instructor. E

5051 Practicum in Aural Rehabilitation (1-6) Prereq: 4720 and 4930. May be repeated. Maximum 9 hrs. E

5060 Neural Bases of Speech and Language (3) Structure and function of central and peripheral nervous systems, with emphasis on their role in speech and language. Prereq: 3065. F, W

5070 Anatomy and Physiology of Hearing (3) Structure of human ear, pathologies of hearing impairment, and psychoacoustics of audition. Prereq: 3710. F

5071 Electroacoustic Measurement of Auditory Function (2) Techniques for electroacoustic measurement of auditory sensitivity, sound transmission by ear, distortion in ear, and ear as analytic mechanism. Prereq: 4720, 5070 or consent of instructor. Sp

5100 Comparative Anatomy of the Peripheral Audiatory Structures (3) Tutorial laboratory course in comparative anatomy of temporal bone employing microscopic dissection techniques. Prereq: 5070 or consent of instructor. E

5110 Introduction to Research in Speech and Hearing (3) Analysis of research techniques, application of statistics, and completion of pilot research project. Prereq: Elementary statistics. F, W, Su

5117 Instrumentation in Audiology and Speech Pathology (3) Principles of instrumentation used in audiology and speech pathology. Prereq: 3010. W, Sp

5119 Laboratory in Instrumentation in Audiology and Speech Pathology (1) Laboratory assignments designed to familiarize student with instruments for measuring speech and hearing characteristics. Prereq: 5117. E

5200 Seminar on Stuttering (3) Current significant research in problem of stuttering. Prereq: 4310 or consent of instructor. W, Su

5201 Aphasia (3) Historical review of aphasia literature, theories of brain functioning, aphasic classification and terminology, tests and rationale for testing, etiology, therapy considerations and prognosis for recovery. Prereq: 5060 or equivalent or consent of instructor. W, Su

5220 Seminar: Articulation Disorders (3) Current significant research in the therapy and management of articulation disorders. Prereq: Undergraduate course in articulation disorders or consent of instructor. F, Sp

5230 Seminar: Voice Disorders (3) Current significant research in theory and management of voice disorders. Prereq: 4400 or consent of instructor. W, Su

5320-30-40 Advanced Clinical Practice in Speech and Language Disorders (1-1, 1-6, 1-6, 1-4) Prereq: 4340 or consent of instructor. E

5340 Advanced Clinical Practice in Speech and Language Disorders (1-1) Prereq: 4320 and consent of instructor. 5340 may be repeated. Maximum 9 hrs. E

5350-60-70 Advanced Clinical Practice in Speech-
5351 Advanced Clinical Practice in Speech-Language Pathology: Public Schools (1-6) May be repeated. Maximum 9 hrs each.

5380 Cerebral Palsy (3) Neurological foundations and speech and language training. Prereq: 5060. (Same as Special Education 5380.) F

5381 Adult Dysarthria (3) Neuromotor organization for adult, production, types of adult dysarthria and associated neuromuscular symptomatology; diagnosis and management of adult dysphonic speakers. Prereq: 5060. Su

5390 Cleft Palate (3) Etiology, diagnosis and clinical management of cleft palate speakers, emphasis on speech. Prereq: 3310. (Same as Special Education 5390.) W, Su


5450 Sound Measurement and Audiometer Calibration (3) Noise measuring systems and techniques; factors in military and industrial audiometry, role of audiologist in industry. Prereq: Basic Acoustics or consent of instructor, W

5451 Noise Audiology (3) Audiologist's role in noise-related activity, clinical, legal and consulting applications. Prereq: 5450 or consent of instructor.

5460 Advanced Audiology (3) Theory and practice of advanced pure tone and speech of audiometry; instrumentation and interpretation of audiometric findings with diagnostic differentiation. Prereq: 4720, F

5470 Impedance Measurement in Audiology (2) Theoretical considerations behind emergence of impedance measurement in clinical measurement of hearing. Practical experience in using several impedance measuring devices. Prereq: 4720 and 5070. W

5490 Practicum in Hearing Conservation (1-8) Supervised on-site experience in hearing conservation programs at industrial settings. Prereq: 5040. May be repeated. Maximum 6 hrs, E, Sp

5500 Seminar in Audiolotry (1-6) Significant research in various areas of audiology. Prereq: Consent of instructor. May be repeated. Maximum 16 hrs, F, Sp

5503 Special Auditory Tests (3) Theoretical and practical considerations of auditory procedures used for differential diagnosis of cochlear vs. retrocochlear auditory lesions, identifying central auditory lesions and nonorganic hearing loss. Prereq: 5460 S

5505 Special Problems in Audiology (1-9) Prereq: 4720 or equivalent and consent of instructor. May be repeated. Maximum 8 hrs, E

5520 Seminar in Speech Pathology (3) Current significant research in speech pathology. Topics vary from quarter to quarter. Prereq: 12 hrs in speech pathology. May be repeated with consent of department. Maximum 12 hrs, E


5550 Special Problems in Speech Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs, E

5560 Independent Study in Speech Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs, E

5570 Management and Supervision for Speech-Language-Hearing Professionals (3) Management systems, accountability, performance appraisal and clinical supervision, FDP and supervisory and clinical language pathologists interested in private practice, supervisory or administrative positions. Su

5600 Independent Study in Audiology (1-6) Special reading, consultation, and research activities in field of audiology. May be repeated. Maximum 6 hrs, E

5610 Practicum: Language Pathology in Children (3) Seminar and practicum involving discussion and utilization of testing tools and analyses of habilitative philosophies, specialties and techniques. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs, Su

5611 Seminar in Language Differences (3) Significant research relevance of culturally different children. Prereq: 4850, Su

5730 Hearing Disorders (3) Advanced study of auditory disorders commonly encountered in medical environment. Application of therapeutic techniques and procedures to differentiate neurological from other types of auditory deviation. Field trips may be required. Prereq: 4720 or equivalent and 5070. F

5740 Pediatric Audiology (3) Advanced study of theoretical and practical considerations of procedures to evaluate hearing of infants and small children. Prereq: 4720 or equivalent. W

5750 Educational Audiology (3) Advanced case management of hearing impaired child: audiologist follow-up; educational alternatives, teacher and parental counseling, social adjustment, classroom acoustics and state and federal guidelines. Prereq: 5040 and 5440. W, Su

5790 Seminar in Psycholinguistic Concepts in Speech Pathology (3) Psycholinguistic concepts and information theory in studying the normal acquisition of language and certain disorders of language. Prereq: Consent of instructor. (Same as Psychology 5790.) Sp

5930 Advanced Aural Rehabilitation (3) Procedures and program, assessment of communication limitations and counseling strategies for hearing-impaired. Prereq: 4930. Sp

5950 The Verbo-Tonal System (3) Theory, procedures, and instrumentation of Verbo-Tonal System in rehabilitation, habilitation, diagnosis, speech therapy, and foreign languages. Prereq: 3710. Recommended prereq: 3050, 4720, and 4930. F, W, Su

6000 Doctoral Research and Dissertation (3-15) Prereq: Consent of instructor. (Same as Psychology 5790.) F, W, Sp

6010 Experimental Phonetics (3) Acoustical and physiological analyses of speech production and perception. Prereq: 5119 or consent of instructor.

6010 Experimental Phonetics (3) Acoustical and physiological analyses of speech production and perception. Prereq: 5119 or consent of instructor.

6019 Experimental Phonetics Laboratory (2) May be taken concurrently with 6010.

6020 Psychoacoustics (3) Auditory reception and perception of non-speech stimuli. Prereq: 8010. W

6029 Psychoacoustics Laboratory (2) Must be taken concurrently with 6020. W

6060 Advanced Speech Physiology (3) Physiology of speech production and theories of speech motor control. Prereq: 5090 or equivalent. Sp

6069 Speech Physiology Laboratory (2) Techniques involved in physiological analysis of speech production. Coreq: 6069. Prereq: 5060 or equivalent. Sp

6070 Advanced Anatomy and Physiology of Hearing Mechanism (2) Prereq: 5070 or equivalent. W, A

6071 Advanced Clinical Concepts and Models in Hearing Science (2) Prereq: 6070 or consent of instructor.

6072 Advanced Study of Auditory Neurophysiology (2) Prereq: 6071 or consent of instructor.

6080 Seminar in Speech Science (3) Advanced study of experimental areas such as speech physiology, acoustic analysis, recognition, perception and intelligibility of speech, communication stuttering, and psycholinguistic measurement of speech and language. Topics vary from quarter to quarter. Prereq: 6100 or consent of instructor. May be repeated. Maximum 9 hrs, Sp, W, A

6090 Seminar in Hearing Science (3) Advanced study of perception of non-speech acoustic signals: detectability, pitch, loudness, differential threshold, adaptation, and fatigue. Prereq: 6020 or consent of instructor. May be repeated. Maximum 9 hrs. W, A

6110 Experimental Design in Speech and Hearing (3) Analysis of experimental design in theses and related journals. Psychophysical methods for data acquisition. Generation of experimental designs based on parametric statistics. Prereq: 5110 or equivalent and consent of instructors.

6117 Theories of Hearing (3) Physiological process basic to classical theories of hearing related to sensitivity; loudness; pitch; and discrimination of acoustic stimuli. Prereq: 5070 or consent of instructor. Sp, A

6500 Advanced Seminar in Audiology (3) Prereq: Consent of instructor. May be repeated. Sp

6520 Advanced Seminar in Speech and Language (3) Topics vary from quarter to quarter but include advanced study of alternations of voice, articulation, speaking time and rhythm, language development or use, and language symbolism. Prereq: Consent of instructor. May be repeated. E

6540 Directed Research (1-4) Participation in ongoing or non-dissertational research. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. E

6570 Directed Study in Speech Pathology (1-3) May be repeated. Maximum 9 hrs, E

6580 Directed Study in Audiology (1-3) May be repeated. Maximum 9 hrs, E

6600 Directed Study in Speech Science (1-3) May be repeated. Maximum 9 hrs, E

Biochemistry

Biochemistry

DEGREES

Biochemistry

M.S., Ph.D.

Professors:
W. D. Wicks (Head), Ph.D. Harvard;
J. E. Churchich, Ph.D. Sheffield (England);
L. Huang, Ph.D. Michigan State; J. G. Joshi, Ph.D.
Poona (India); K. J. Mony Ph.D. Rochester;
T. P. Sato (Emeritus), Ph.D. Michigan

Assistant Professors:
A. H. Fambourg, Ph.D. California (Berkeley);
E. Freire, Ph.D. Virginia; J. W. Koontz, Ph.D.
Kentucky

Adjunct Faculty:
W. Farkas, Ph.D. Duke; S. Kneel, Ph.D. California
(San Diego); B. Lewis, Ph.D. Yale

The graduate program involves successful completion of a year of graduate course work and seminars. In addition, the M.S. degree requires research leading to the writing and oral defense of a thesis, while the Ph.D. degree requires successful completion of a comprehensive examination and extensive research leading to the Ph.D. dissertation and its oral defense.

THE MASTER'S PROGRAM

This program requires about two years of full-time study and provides both breadth and depth of training in areas of graduate work in chemistry and absorb future advances in these fields. Recent graduates of this program are now involved in such occupations as industrial pharmaceutical research, junior college and university teaching, hospital and university laboratory work, cancer research, scientific journalism, and pursuit of Ph.D. degrees.
Candidates usually should offer course work covered by an undergraduate major in the biological sciences, chemistry or biochemistry. Departmental requirements consist of the satisfactory completion of 45 credit hours of graduate work and the mastery of the subject matter of the following courses:

1. Introductory Organic Chemistry with laboratory (at least one year), and a minimum of three quarters of approved physical chemistry.
2. A minimum of 12 quarter hours of approved biology courses beyond the introductory level, including at least 3 hours of genetics and 3 hours of physiology.
4. At least 9 hours of advanced lecture-seminar courses from the following: Biochemistry 5410, 5010.
5. At least 9 hours of Master's research and a thesis.
6. A final oral examination which will cover both the thesis endeavor and the subject matter of the course requirements.

**The DOCTORAL PROGRAM**

An incoming student must present course work covering an undergraduate major in the biological sciences, chemistry or biochemistry. Departmental requirements for the awarding of the Ph.D. include mastery of the subject matter indicated in the following list of courses.

1. Introductory Organic Chemistry with laboratory (at least 1 year), Introductory Physics*, Differential and Integral Calculus*, recommended of three quarters of approved physical chemistry (Biochemistry 4210-20-30 or Chemistry 3410-20-30) and at least 18 hours of biology beyond the introductory level including at least 3 hours of genetics and 3 hours of physiology.
3. At least two quarters of approved graduate courses in chemistry, physics, or other physical sciences, for example: Chemistry 5110-20-30-35, Physics 5340, Physics 5210-20-30, Physics 5440, Physics 5510-20-30. No survey or review courses will be allowed.
4. At least two courses selected from 6120-30-40-50-60.
5. Participation in Biochemistry 6410 and in the Advanced Biochemistry Seminar (6010) during the entire period of residence.
6. Comprehensive examination: usually taken after the second year of study.
7. A dissertation reporting the results of original and significant research carried out during the term of candidacy.
8. A final oral examination which will be concerned primarily with the student's dissertation.

**Petitioning for Master's degree:** Students who have passed the comprehensive examination in the Ph.D. program and have completed at least 45 hours of approved course work for graduate credit, at least two-thirds of which must be at or above the 5000 level, may petition the department for award of a Master's degree. The additional requirements for such a degree shall be:

- The preparation of a research manuscript suitable for submission for publication in a major scientific journal; and oral defense of that manuscript before the examining committee of three faculty members appointed by the head of the department, at least two of whom shall be members of the department.
- A publication of at least one full-length paper in a major biochemical journal as senior author.
- A. Cell and Cellular Biochemistry (4, 4) Electrolyte behavior; chemistry and structure of proteins; enzyme behavior and biological function; catabolism; anabolism; nucleic acid function, protein synthesis and biochemical genetics; regulation of biological processes. Must be taken in sequence. Prereq: Chemistry 3211-21-31, 3219-29-39, and 1 course from Biology 1210-20-30 or Botany 1110-20-30. 3 lectures and discussion. F, Sp.
- 4119 Cellular and Comparative Biochemistry Lab (2) Basic analytical and biochemical procedures in biochemistry and molecular biology. PH titrations, spectrophotometry, chromatography, electrophoresis, sedimentation, and radioisotopic labeling, and immunological analysis. Prereq or coreq: 4110 or equivalent. F, W.
- 4129 Cellular and Comparative Biochemistry Lab (2) In depth experiments with enzymes, nucleic acids and membranes. Techniques of hybridization, sequencing, sedimentation, radioisotopic labeling, and immunological analysis. Prereq or coreq: 4110-20 and 4119. Sp.
- 4210-20 Introduction to Physical Biochemistry (3, 3) - Introduction to thermodynamics; phase stability and phase change; chemical potential; osmotic pressure; activity and the Debye-Huckel model; electrophotometry, membrane permeability. - Elements of statistical mechanics, diffusion, collision theory, chemical kinetics and transition state theory. Higher order kinetics and transition state theory, higher order kinetics. - Specialized kinetics of enzymatic processes; some biopolymer considerations. Prereq. Chemistry 1840-56-60, Chemistry 3211-21-31 and 3219-29-39, and an introductory course in biology. F, W.
- 4230 Introduction to Physical Biochemistry (3) Physical characteristics of macromolecules, polymerization reactions, absorption and fluorescence, sedimentation and transport, hydrodynamics; electrophoretic mobility, light scattering, and structural x-ray crystallography of proteins and nucleic acids. Prereq: 4220 or Chemistry 3430, or equivalent. Sp.
- 5000 Thesis (1-15) P/NP only. E
- 5300 Graduate Research Participation (3-9) May be repeated. Maximum 12 hrs.
- 5310 Experimental Techniques (3) Laboratory course in modern experimental methodology and instrumentation. Intended primarily for graduate students. Prereq: Consent of instructor.
- 5320-30 Experimental Techniques (3, 3) Laboratory rotations. Student works in laboratory of faculty member on clearly defined project. Written proposal and oral report required. Intended primarily for departmental graduate students. Prereq: 5310. W, Sp.
- 5450 Special Topics (1-3) Registration only by prior arrangement with department. May be repeated.
- 5510-20-30 Advanced Biochemistry (3, 3, 3) Topics in biochemistry and molecular biology. Prior knowledge of biochemistry and molecular biology, equivalent of a major in biochemistry and molecular biology, immunological techniques, metabolic pathways, and fundamentals in gene expression. Lecture material; original literature and review articles. Experimental approaches to current problems in biochemistry and molecular biology. Designed for graduate students in biological sciences. May be taken for 1 credit or 2 credits or 3 credits, or consent of department. F, W, Sp.
- 5610 Environmental Toxicology (3) Basic concepts in toxicology, interactions at subcellular, cellular, organismal, population, and environmental levels, legal aspects, and major emphasis on biochemical toxicology. Prereq: 4110-20, Chemistry 3211-21-31, Chemistry 4910-29-30, or consent of instructor. (Same as Ecology 5614) W
- 6000 Doctoral Research and Dissertation (3-15) P/ NP only. E
- 6110 Advanced Topics in Biochemical and Biophysical Methods (1-3) Application of modern biological and biochemical techniques in the study of properties of biological macromolecules and membranes. Static and time-resolved fluorescence spectroscopy, calorimetry, magnetic resonance, x-ray crystallography, gene cloning, hybridoma technology, electron microscopy, and other techniques. Prereq: 5510-20-30 and 4230.
- 6120 Advanced Topics in Mechanisms of Enzyme Catalysis (3) Enzyme mechanisms, including specificity and rate accelerations; enzyme-substrate complementarity; theories of catalysis; measurements and magnitude of catalytic rate constants; rapid mixing techniques; relaxation methods; rate-determining processes; group transfer reactions; oxidations and reductions; eliminations, isomerizations and rearrangements and reactions that make and break carbon-carbon bonds. Prereq: 5510-20-30 and 4220.
- 6140 Advanced Topics in Membrane Structure and Function (1-3) Structural organization of biological membrane components, dynamic properties as studied biophysically and biologically. Techniques of study of lipid membranes related to structural organization. Prereq: 5510-20-30.
- 6150 Advanced Topics in Metabolic Regulation (1-3) Catalysis and enzyme regulation. Effects of allosteric analytes by metabolites or hormones; regulation due to ligand interactions or covalent modification; hormone-receptor interactions, internalization, degradation and recycling. Prereq: 5510-20-30.
- 6170 Current Topics in Biochemistry (1) Seminars and lectures dealing with current advances in field of chemical biology. May be repeated with consent of department. S/NC only. F, W, Sp.
- 6431 Current Topics in Environmental Toxicology (1) Critical reviews of research problems and methods in environmental toxicology: behavioral toxicology, biochemical and ecological effects, and behavioral toxicology, biochemical and ecological effects, and ecological effects.
epidemiology. Presentations by students, faculty and guest lecturers from academia and industry. May be repeated with consent of department. Maximum 6 hrs. (Same as Ecology 4631.) S/NC only. F, W, Sp

6440 Current Topics in Regulation of Protein Function (1) Covalent modifications of proteins by phosphorylation-dephosphorylation, allosteric inter-actions, etc. Prereq: 4110-20 or equivalent. May be repeated. Maximum 9 hrs. S/NC only. F, W, Sp

6450 Advanced Special Topics (1-3) Registration only by prior arrangement with department. For students who have passed Ph.D. preliminary examination or have advanced state of graduate studies. Topic title posted in advance. May be repeated. Maximum 9 hrs.

Biology

4150 Scientific Illustration (3) Introduction to design and production of graphs, charts for scientific illustration; planning of poster presentations and displays. No graphics background required. Prereq: Advanced standing in a science curriculum; consent of instructor.

Botany

MAJOR DEGREES

Botany M.S., Ph.D.

Professors:

Associate Professors:
C. C. Amundson, Ph.D. Colorado; A. S. Heilman, Ph.D. Ohio State; R. R. Henke, Ph.D. Miami (Ohio); L. G. Kickok, Ph.D. Massachusetts; B. Mullin, Ph.D. North Carolina State; O. J. Schwarz, Ph.D. North Carolina State; W. O. Smith, Ph.D. Duke.

Assistant Professors:
E. E. Schilling, Ph.D. Indiana; D. K. Smith, Ph.D. Tennessee; B. E. Wofford (Curator), Ph.D. Tennessee.

*Alumni Distinguished Service Professor

The Department of Botany offers the Master of Science and Doctor of Philosophy degrees with concentrations in anatomy, bryology, cytology, cytogenetics, ecology, genetics, lichenology, morphology, mycology, phycology, physiology, pteridology, and taxonomy.

Educational service is required of each graduate degree candidate and such service will include teaching and/or ancillary services performed in the department related to the instruction of courses.

For further information, contact the Department Head or the Graduate Coordinator.

Requirements for Admission: The Botany Department requires scores from the general and subject specific portions of the Graduate Record Examination, at least three letters of recommendation or standard recommendation forms from academic or professional persons, a short statement describing reasons for interest in graduate education in botany, and the following specific courses: (1) general botany or biology, 12 quarter hours; (2) advanced botany or closely allied biological sciences, 16 quarter hours; (3) physical sciences; general inorganic chemistry, 12 quarter hours organic chemistry and physics highly recommended; (4) college mathematics, 9 quarter hours

THE MASTER’S PROGRAM

Thesis Option:
1. Satisfactory preparation of a written formulation and as oral defense to the student’s committee of a research proposal suitable for a thesis program. Must be completed before enrollment in Botany 5000.
2. Designed reading proficiency in one modern foreign language or in the use of computers for data analysis. Proficiency in a foreign language may be demonstrated by satisfactory performance on an examination or an equivalent. Computer Science 1510 or 1610, Computer Science 2710, and Computer Science 4310 or 4580.
3. Satisfactory completion of 9 credit hours at the 6000 level.

The DOCTORAL PROGRAM

1. Satisfactory presentation of a written formulation and oral defense to the student’s committee of a research proposal suitable for a dissertation program. Must be completed before enrollment in Botany 6000.
2. Satisfactory performance on a written and oral comprehensive examination.
3. Presentation of one or more cognate areas outside of the department totaling 9 graduate credit hours with at least a B average.
4. Satisfactory performance on an examination in one modern foreign language or an A or B in French 3030 or German 3030.
5. Satisfactory completion of 9 credit hours at the 6000 level (excluding dissertation).
7. Presentation of a one-hour departmental seminar near the end of the doctoral program.

*Note: Graduate School requirements are denoted by an asterisk. These requirements should be interpreted as minimal requirements and specific stipulations or requirements such as additional foreign languages, additional oral comprehensive examinations may be required by the individual student’s faculty committee.

**3010-20 Plants in Evolution (4, 4) Monera to angiospermae; emphasis on evolutionary relationships, morphology and development. Prereq: 6 hrs. in biological sciences. F, W

**3030 Field Botany (4) Study of plants in natural environments including plant identification, collection, preservation and basic ecological concepts. Prereq: 6 hrs in biological sciences. Sp, Su

3031-32 Field Botany (4, 4) Emphasis on fall and winter flora respectively. Prereq: 3030. Need not be taken in sequence. F, W

3050 Socioeconomic Impact of Plants (3) Significance of plants in origin and development of human cultures, evolution of cultivated plants, and role of plants in present civilizations. Occasional field trips. Sp, Su

3070 Genetics and Society (3) An introduction to genetics, anthropology and evolution with emphasis on their implications for human society. (Same as Anthropology 3070.) W

3090 Biology and Human Affairs (3) Basic biological principles involved in determination and preservation of an environment in which human cultures may survive. F

3120 Introductory Plant Physiology (4) Organismal physiology of plants; water relations, mineral nutrition, growth processes, effects of age, light, natural rhythms, temperature and other environmental factors. Lecture and lab. Prereq: 1 yr general chemistry and 1 yr biological science. F, Sp, Su

4017 Field Mycology (3) Field experience on identification of higher fungi. Freqnt field trips, field recognition of species and habitats, laboratory sessions. Prereq: 3030-20 or equivalent. Recommended prereq: 3090-20 or equivalent. A, Su

4021 Field Bryology (3) Field experience on identification of mosses and liverworts. Freqnt field trips, field recognition of species and habitats, laboratory sessions. Prereq: 6 hrs of botany. Recommended prereq: 3010-20 or equivalent. A, Su

4022 Field Lichenology (3) Field experience on identification of lichens. Freqnt field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent.

4023 Field Agrostology (3) Field experience on identification of grasses. Freqnt field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent. A

4030 Mechanisms of Plant Speciation (3) Processes of plant speciation emphasizing population genetics, isolation, hybridization, variation in populations, establishment of population barriers and other aspects of plant speciation. Prereq: 3010-20 and Biology 3110. W

4045 Aquatic Vascular Plants (3) Field experience on identification of aquatic vascular plants. Freqnt field trips, field recognition of species and habitats. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent. A

4050 Synanthropology (3) Field experience on identification of composite. Freqnt field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent. A


4061 Field Phycology (3) Field experience on identification of fresh water algae. Freqnt field trips, field recognition of species and habitats; laboratory
equivalent. Photos processed and critiqued in class. Prereq: 3010-20 or equivalent.

4080 Field Pteridology (3) Field experience on identification of ferns and fern allies. Field trip to highly instrumented field sites. Prereq: 3020-30 or equivalent; Chemistry 3210 or 3700 and 3518; Ornamental Horticulture and Landscape Design 3030; and Plant and Soil Science 3120.

4380 Field Measurements in Plant Ecology (3) Practicum in use of field and laboratory instruments for measurement of environmental factors, plant functions, and/or community characteristics. Data collection, analysis and interpretation. Visits to field sites. Prereq: 3030 or equivalent; 1 year physics and chemistry recommended. F

5000 Thesis (1-15) P/NP only. E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5003-04 Non-Thesis Research (3, 3) Library, field, or laboratory research under supervision of staff member. Criteria and types of systematic problems. Cytotaxonomy, numerical taxonomy. Prereq: Consent of instructor. F

520 Advanced Plant Physiology (3) Plant cell metabolism: carbon, nitrogen and sulfur assimilation, respiration and biosynthesis of specialized plant products such as terpenoids, alkaloids and pigments. Prereq: 3020-30 or equivalent. F

522 Advanced Plant Physiology II (3) Physiological regulation of response of plants to light: photochemistry, photosynthesis, and phytocrome mediated response. Water and salt uptake; ion concentrations; translocation; and fundamentals of mineral nutrition. Prereq: 5210 or Biochemistry 4120 and plant or cell physiology course. Recommended prerequisite: 1 year of physics. W

5235 Advanced Plant Physiology III (3) Growth and differentiation of plants at molecular, cellular and organismal levels. Hormonal regulation of development; macromolecular interpretation of differentiation for mor- phogenesis; flowering; and senescence. Prereq: 5210 or Biochemistry 4120 and a plant cell physiology course. Recommended prerequisite: 5220. Sp

5290 Quaternary Problems (4) (Same as Geology 5290 and Zoology 5250.)

5310-20-30 Special Problems in Botany (1-6, 1-6, 1-6) Requirements and interests of students determine topics, such as actions of chemicals on actively dividing cells, current ultrastructural research in selected physiological phenomena of morphogenesis-correlations, polarity, development of gene action, controlling elements, transformation, eicosanoids, and adaptation. Prereq: Botany 5110. 3 hrs and 1 lab. W, A

5310 Vascular Plant Taxonomy (4) Family characteristics of vascular plants. Principles of identification, classification. Based primarily on plants of local flora. Prereq: 3030 or equivalent. 2 hrs and 2 labs. Sp, A

5365 Phytophylacteriology Ecological (3) Interaction between environment and phytophylacterios. Nutrient uptake, primary production, crop type, ecological theory applied
to phytophylacteri, and physiological adaptations by populations to environment. Prereq: 3010 or consent of instructor. F, A

5270 Principles of Biological Illustration (3) Principles and application of photographic reproduction, including photomicrography and photomacrography, drawing, and editing for presentation for publication. Prereq: 3020-30 or consent of instructor. 2 hrs and 2 classes or field trips. F, A

5090 Morphology and Evolution of Basidiomycetes (4) Structure and function of somatic and sexual life cycles as applied to evolution in group. Cultures and specimens in laboratory. Prereq: 3010 or equivalent. F

5120 Agrostology (4) Collection, identification, classification, and phylogeny of tribes of grasses. Prereq: 3030 or consent of instructor. 2 hrs and 2 labs. F, A

5150 Advanced Morphology of Flowering Plants (4) Vegetative and reproductive organography: regulatory physiology, floral development, pollination mechanisms, embryology and deviations, seed and fruit development. Prereq: 3020-30 or 4120; 3210 or consent of instructor. F

5160 Biosystematics (4) Major experimental methods used in systematic and application to selection of systematic problems. Cytotaxonomy, numerical taxonomy and chemotaxonomy. Prereq: Consent of instructor. F

5210 Advanced Plant Physiology I (3) Plant cell metabolism: carbon, nitrogen and sulfur assimilation, respiration and biosynthesis of specialized plant products such as terpenoids, alkaloids and pigments. Prereq: 3020-30 or equivalent. F

5220 Advanced Plant Physiology II (3) Physiological regulation of response of plants to light: photochemistry, photosynthesis, and phytocrome mediated response. Water and salt uptake; ion concentrations; translocation; and fundamentals of mineral nutrition. Prereq: 5210 or Biochemistry 4120 and plant or cell physiology course. Recommended prerequisite: 1 year of physics. W

5235 Advanced Plant Physiology III (3) Growth and differentiation of plants at molecular, cellular and organismal levels. Hormonal regulation of development; macromolecular interpretation of differentiation for morphogenesis; flowering; and senescence. Prereq: 5210 or Biochemistry 4120 and a plant cell physiology course. Recommended prerequisite: 5220. Sp

5290 Quaternary Problems (4) (Same as Geology 5290 and Zoology 5250.)

5310-20-30 Special Problems in Botany (1-6, 1-6, 1-6) Requirements and interests of students determine topics, such as actions of chemicals on actively dividing cells, current ultrastructural research in selected ecological systems. State system and change of state. Elementary network concepts of ecosystems. Prereq: 4310 or biology 4240, 5860; calculus or equivalent 5520—Flows of energy and materials in ecosystems. Analogy computation, application to multiple environmental. General principles and isolation of subcellular components; differentiation and ultracentrifugation; photomicrography and microcinematography. Intended for graduate students in the biological sciences. 2 hrs and 2 labs. Sp, A

5810 Cytoelastic (4) Chromosome structure and behavior during mitotic and meiotic divisions in relation to structural changes, genetic controls, hybridization, specialization, and polyploidy. Laboratory emphasis on normal and aberrant meiotic systems and somatic chromosomes from plants and animals. Prereq: Biology 3110 and at least 6 additional hrs in biological sciences. Sp, A

5820 Methods and Instrumentation in Laboratory Investigation (1) Laboratory course providing project experience and theoretical background and practical research methods, isolation, adsorption spectroscopy, disc electrophoresis, polarography, Zold and ultracentrifugation, gas chromatography, automatic analyzers, microscopy, culture methods, use and detection of radioisotopes, and others. Prereq: Course in plant physiology, Chemistry 3211-31-31 or equivalent, Physics 2210-22-30 or equivalent. S/NC only.

5830 The Field Research Problem (4) Conceptualization, planning, and implementing research field. Criteria for choosing instruments, sampling methods, and locations for study of populations, communities, and ecosystems. Field practice. Development and critique of formal research proposal like those required by granting and consulting agencies. Prereq: 4310, 5350 or Zoology 5420, 5860. Su

5850 Methods and Instrumentation in Field Investigations (4) Intensive field work using appropriate methods and instrumentation. Topics vary according to needs of students. May be repeated with consent of instructor. S/NC only. W

5870 Experimental Plant Genetics (4) Genetics of plant stress responses, background to experimental design, basic mechanisms of gene action, controlling elements, transformation, eicosanoids, and adaptation. Prereq: Biology 3110 and Chemistry 3521. 3 hrs and 1 lab. W, A

5910-20 Developmental Plant Morphology (3, 1) Developmental morphology of plants from aspect of plant physiological background. Basic genetics, symmetry, differentiation, regeneration, tissue mixtures, abnormal growth, environmental and genetic factors. Prereq: 3010-20 or 4120, and 3210 or 5210 for 5910; 5910 for 5920, 2 hrs and 1 lab for 5910; 2 hrs and 1 lab for 5920. F, A, W

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6010 Advanced Topics in Morphology of Vascular Plants (2-4) Needs in advanced study. Advanced Topics selected from broad categories of experimental anatomy, morphology, and morphogenesis. Prereq: 3020-30 or 4120, 5910-20 or consent of instructor. May be repeated with consent of department.

6060 Advanced Topics in Cryptogamic Botany (2-4) Advanced studies and current research in experimental morphology, mycology, bryology, pteridology, or developmental morphology. May be repeated with consent of department.

6130 Advanced Topics in Cryptogamic Botany (2-3) Requirements and interests of students determine topics, such as actions of chemicals on actively dividing cells, current ultrastructural research in selected
cytoplasmic organelles and cellular systems, experimental cytology, cellular control of nucleic and biosynthesis. Prereq: 5780, Biology 3110; Biochemistry 4110-20. May be repeated with consent of department.

6320 Ecosystems of the World (3) Classification and chemistry of terrestrial and freshwater ecosystems. Interactions of climate topography, soils, vegetation, and fauna. Prereq: 5340. F, A

6370 Applied Ecology (4) (Same as Ecology 6370.)

6420 Advanced Topics in Genetics (2-4) Literature survey of selected topics from all areas of genetics. Prereq: Biology 3110; Biochemistry 4110-20. May be repeated with consent of department.

6620 Seminar in the History of Botany (2) F, A

6820 Advanced Topics in Plant Physiology (2-4) Requirements of student determine content, including growth and growth hormones; minor element nutrition; photoperiodism; radiation effects. Prereq: 5210, 1 yr college physics. May be repeated with consent of department.

6830 Advanced Topics in Ecology (2-4) Needs of student determine content, such as morphogenesis; ecology; evolution; genetics; taxonomy. Prereq: General botany; system ecology. Prereq: 4310, 5340, 5350. May be repeated with consent of department.

6930 Advanced Topics in Systematic Botany (2-4) Prereq: 6920, 6929. May be repeated with consent of department.

7030 Advanced Topics in Systematic Botany (2-4) Needs of student determine content, such as morphogenesis; ecology; evolution; genetics; taxonomy. Prereq: General botany; system ecology. Prereq: 4310, 5340, 5350. May be repeated with consent of department.

7930 Advanced Topics in Systematics (2-4) Prereq: satisfactory completion of the following is required: systematic botany (5911-21-31; during the entire period of graduate study. Prereq: 4310, 5340. F, A

Chemistry

MAJOR DEGREES

Chemistry M.S., Ph.D.

Professors: G. Mamantov (Head), Ph.D. Louisiana State; J. E. Bloo, Ph.D. Manchester; N. S. Bowman, (Emeritus); Ph.D. Princeton; W. E. Bull, Ph.D. Illinois; J. O. Chambers, Ph.D. Kansas; R. N. Compton, Ph.D. Tennessee; J. A. Dean, (Emeritus); Ph.D. Michigan; J. F. Eastham, Ph.D. California (Berkeley); W. H. Fletcher, (Emeritus); Ph.D. Wisconsin; M. H. Lietzke, Ph.D. Wisconsin; R. M. Magid, Ph.D. Yale; R. E. Pagni, Ph.D. Wisconsin; J. A. Patterson, Ph.D. California (Berkeley); H. H. Ross, Ph.D. Wayne State; G. K. Stryer, Ph.D. Illinois; D. A. Shirley, (Emeritus); Ph.D. Iowa State; W. T. Smith, (Emeritus); Ph.D. Ohio State; W. A. Van Hook, Ph.D. Hopkins; E. L. Weihe, Ph.D. Purdue; T. F. Williams, (Emeritus); Ph.D. London; J. H. Wood, (Emeritus); Ph.D. North Carolina.

Associate Professors: J. L. Adcock, Ph.D. Texas; F. A. Grims, Ph.D. Cornell; J. D. Kovac, Ph.D. Yale; G. A. Lane, Ph.D. California (Berkeley); L. J. Magid, Ph.D. Tennessee; F. M. Schell, Ph.D. Indiana; C. Woods, Ph.D. North Carolina State.

Assistant Professors: S. C. Brandt, Ph.D. California (Berkeley); E. C. Barnes, Ph.D. Stanford; J. E. Bartmess, Ph.D. Northern, K. D. Cook, Ph.D. Wisconsin; C. S. Feigl, Ph.D. Colorado; M. J. Stapanian, Ph.D. Iowa State.

*Alumni Distinguished Service Professor

Students majoring in Chemistry for the Master's or doctoral degree are required to present as a prerequisite one year each of general, analytical, organic and physical chemistry with a satisfactory record. Students lacking any of these prerequisites may be admitted with appropriate deficiencies which must be removed without graduate credit. Applicants are required to take the general and subject chemistry Graduate Record Examination.

For students majoring in Chemistry, the prerequisite is two years of chemistry including quantitative analysis.

THE MASTER'S PROGRAM

The department offers specialization in advanced topics in the year of graduate study. Prereq: 5210, 5250-60-70, 5340-50, 5410-29-30, 5810. Mechanical Engineering 4180, plus selected courses from other areas of chemistry, environmental engineering, meteorology, microbiology, health physics, ecology, computer science, statistics, and industrial health; (2) for energy, 5410, 5610-20-30, a chemistry course; (3) for environmental, 5110-20-30-35 or 5420-30-50 or 5710-20-30, 5810. Mechanical Engineering 4180, plus selected courses from other areas such as catalysis, heterogeneous equilibria, kinetics, thermal science, combustion and propulsion engines, resource economics, civil engineering, and electrical engineering.

For specializations in chemical physics, an examination on the basic principles of chemistry, electricity, and magnetism; 5410-20-30-50, 5110-20 or 5710-20, 6730 or 6810, Mathematics 4540, 4610, 4710, Physics 4510-20-30, 5110-20-30, 5210, 5610-20-30.

f. Specialization in inorganic, physical, or theoretical chemistry, 39 hours of additional graduate course work including at least 6 hours at the 6000 level and one of the following groups: (1) in analytical, 5420, 5710-20-30; (2) for inorganic, 5420, 5710-20-30; (3) for organic, 5110-20-29-30-35; (4) for physical, 5340-50, 5410-20-30-50, (5) for theoretical, 5340-50, 5410-20-30-50; Physics 5210.

g. Specialization in environmental or energy, a six-month internship in a governmental or industrial laboratory; 39 hours of additional graduate course work including 6 hours at the 6000 level and the following: (1) for environment, 5220, 5250-60-70, Ecology 5310, Environmental Engineering 4030, plus selected courses from the particular department.

3. Sufficient graduate course work in chemistry and/or a related field to make an overall total of 45 hours, including:

a. 4180-70.

b. Two of the following (except for polymer science): 5611, 5521, 5531.

c. For emphasis in polymer science, 5351, 5410-50, Polymer Engineering 4910 and participation in the Polymer Seminar Program during the entire period of graduate study.

d. For emphasis in environment, 5220, 5250-60-70, Ecology 5310, and Environmental Engineering 4030.

(e) For emphasis in energy, 5410, 5610-20-30, a chemistry sequence (5110-20-30-35 or 5250-60-70 or 5420-30 or 5710-20-30, 5810) and Mechanical Engineering 4180.

f. For other specializations, one of the following sequences: 5110-20-29-30, 5340-50, 5140-20, 5710-20-30. All course sequences must be approved by the appropriate departmental committee.

4. A final oral examination.

THE DOCTORAL PROGRAM

The department offers specialization in advanced topics in the year of graduate study. Prereq: 5210, 5250-60-70, 5340-50, 5410-20-30-35, 5810, and Mechanical Engineering 4180.

For emphasis in environmental or energy, a six-month internship in a governmental or industrial laboratory; 39 hours of additional graduate course work including at least 6 hours at the 6000 level and at least 12 hours of chemistry courses; participation in the Polymer Seminar Program during the entire period of graduate study.

Graduate course work in related fields may be used for undesirable course work in this requirement. All course sequences must be approved by the student's faculty committee.

All course selections must be approved by the appropriate departmental committee.

4. A comprehensive advanced examination in the field of specialization.

5. Demonstration of a reading knowledge of one of the following languages: French, German, Russian, or an approved alternate.

6. A final oral examination.

*3211-21-31 Organic Chemistry (3, 3, 3) Compounds of carbon and their reactions, structure of organic molecules, spectroscopic and other physical properties. Must be taken in sequence. Prereq: 1110-20-30. Corresponding lecture (3211-21-35) is a coreq for students not having credit for the laboratory. E

*3219-29-39 Organic Chemistry Laboratory (1, 1, 1) Experiments on topics discussed in 3211-21-31. Corresponding lecture (3211-21-35) is a coreq for students not having credit for the lecture. E


4920 Biophysical Chemistry Laboratory (2) Experiments in biophysical chemistry of biologically important systems. Coreq: 4920. Not open to students in 3410. 20-30-29-39.

5000 Thesis (1-15) P/NP only. E


5130 Spectroscopic Characterization of Organic Compounds (3) Introduction to vibrational, electronic, and nuclear magnetic resonance spectroscopic methods; mass spectrometry, x-ray crystallography, and electron diffraction. Prereq: 4920. F.

5140 Introductory Polymer Chemistry (3) Fundamental principles, role of chemistry in interdisciplinary field of polymer science; relation of molecular structure to bulk properties of polymers. Prereq: 1 yr each undergraduate organic and physical chemistry. Sp.

5150 Kinetics of Polymerization (3) Kinetics of formation and molecular weight distributions of polymers, homogeneous and heterogeneous step growth and chain growth polymizations. Prereq: 5140 and 4160-70 equivalent.

5160 Organic Chemistry of Polymers (3) Synthesis of monomers; mechanism, stereochemistry, and sequence distribution of polymizations. Formation of block, graft, and network polymers. Reactions on polymers, including degradation. Prereq: 5140 and 5551. A

5170 Physical Chemistry of Polymers (3) Rubber elasticity, solution chemistry of macromolecules; structural, configurational, and conformational statistics of polymers. Prereq: 5150. A

5220 Analytical Chemistry of Environmental Pollutants (3) Application of modern analytical chemistry to problems in environmental chemistry of natural and synthetic pollutants. Prereq: 5250-60-70 or consent of instructor. A

5340 Chemical Instrumentation (4) Principles of chemical instrumentation. Practice in design and construction of chemical instruments; special project. Prereq: Consent of instructor.

5350 Quantum Chemistry (3) Electronic excited states; introduction to group theory and its application to the reactivity of organic molecules. Prereq: 5340. W


5511 Survey of Inorganic Chemistry (3) Atomic structure, wave mechanical atoms, ionic and covalent bonding, inorganic reactions, inorganic stereochemistry, coordination chemistry, and descriptive chemistry of the elements. F

5521 Survey of Analytical Chemistry (3) Volumetric and gravimetric analysis; acid-base, oxidation-reduction, complexation and precipitation equilibria; spectrophotometric, electroanalytical, and separation methods. F


5532 Survey of Inorganic Chemistry (3) Bonding in inorganic compounds, chemistry of transition elements. Prereq: Chemistry major or minor. F, W.


5810 Nuclear Chemistry (3) Nuclear properties, radioactivity, radioactive decay processes, nuclear structure and models, nuclear reactions, and radiation and radiation detection. Prereq: 1 yr of physical chemistry. F

5911-21-31 Chemistry Seminar (1, 1, 1) Departmental research, current literature, special topics. May be repeated. 5 hrs. F, W, Sp.

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6111 Selected Topics in Organic Chemistry (3) Subject matter varies among important topics of current significance. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A

6130 Natural Product Chemistry (3) Structure, chemistry, and synthesis of naturally occurring substances of biological or economic significance. Course content may vary each quarter to reflect areas of current chemical interest. Prereq: Two of 5110-20-30-35.


6165 Orbital Symmetry Control (3) Application of Wood-Ward rules to problems in molecules to mechanism and stereochemistry of concerted organic reactions. Prereq: Two of 5110-20-30-35.


6210 Advanced Analytical Spectroscopy (3) Newer methods of spectroscopic analysis, including: transform methods, lasers in spectroscopy, fiber optics, introductory nonlinear optics, and spectroscopic techniques for remote sensing. Prereq: 5250.

6211 Selected Topics in Analytical Chemistry (3) Subject matter varies among important topics of current significance: environmental chemistry, spectroelectrochemistry, modern liquid chromatography, nmr, electroanalytic methods, biosynthetic methods, and nmr and microprocessor applications in chemical instrumentation. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A

6211 Selected Topics in Polymer Chemistry (3) Subject matter varies among important topics of current significance. Prereq: Two of 5140-50-60-70 or consent of instructor. May be repeated. A

6220 Nuclear Magnetic Resonance (3) Theory of nuclear magnetic resonance spectroscopy with emphasis on high-resolution methods. Applications to problems in nuclear structure and behavior. Prereq: Two of 5110-20-30-35.

6430 Photochemistry and Radiation Chemistry (3) Fundamental physical and chemical processes pursuit to excitation of molecules by photons and electrons; multiphoton processes and uses of laser sources; fluorescence and phosphorescence; radiations in chemical reactions as studied by optical spectroscopy; chemical reactivity of excited states; ion-molecule and free radical reactions; electron capture and electron transfer processes. Prereq: 5430.

6450 Electrochemistry (3) Electrode kinetics; transport properties of electrophilates; electroanalytical methods. Prereq: 5430 or 5270.

6475 Electronic Structure of Radicals (3) Applications of electron spin resonance to study of molecular conformation, structure, and bonding in organic and inorganic radicals; comparison of experimental results with theoretical predictions based on Walsh rules and on INDO molecular orbital calculations. Prereq: 5340-50 and 6520.

6480 Statistical Thermodynamics (3) Application of statistical mechanical methods to systems of chemical interest such as isotope effects on equilibrium and rate constants, phase equilibria, condensation phenomena. Prereq: 5410, 5450.

6495 Advanced Chemical Kinetics (3) Mechanism of elementary chemical reactions at molecular level including topics such as dynamics of molecular collisions, potential-energy surfaces, reaction cross-sections, "direct" vs "complex" modes of reaction, photofragmentation, energy partitioning and transfer, chemiluminescence, and chemical lasers. Prereq: 5430.

6510 Thermodynamics of Solutions (3) Theory of regular solutions and of electrolyte solutions; measurement of activity coefficients and other thermodynamic properties; selected topics from literature. Prereq: 5410.

6520 Magnetic Resonance (3) Principles of magnetic resonance spectroscopy underlying nuclear magnetic resonance and electron spin resonance. Chemical applications to solid and liquid systems. Prereq: 5340.

6711 Selected Topics in Inorganic Chemistry (3) Subject matter varies among important topics of current significance: photochemistry, spectroscopy, transition chemistry, organometallic complexes, inorganic solution kinetics and mechanisms, crystal chemistry, nonaqueous chemistry, and electron transfer reactions. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A


6750 Molten Salt Chemistry (3) Structure, spectroscopic properties, solution thermodynamics, electromechistry and phase equilibria of molten salts. Solutions of metals in molten salts. Prereq: 4110 and 5410 or equivalent.

6810 Vibrational Problems in Moleculs Spectra (3) (Same as Physics 6810.)

6811 Selected Topics in Nuclear Chemistry (3) Subject matter varies among important topics of current significance: nuclear decay schemes, nuclear models, nuclear reaction theory, nuclear detection techniques, activation analysis. Prereq: Consent of Instructor. May be repeated. Maximum 9 hrs. A

6820 Molecular Vibration-Rotation Theory (3) (Same as Physics 6820.)

Classics


The graduate courses in the Classics include the wider reading of Greek or Latin authors in a selected field, a more detailed study of one of the great departments of classical literature, and the development of background for the appreciation of Greek or Roman life and literature.

Greek

3010 Plato (3) A

3020 Herodotus (3) A

3030 Euclid (2) A

4020 Aeschylus, Sophocles (3) A

4040 Aristophanes (3) A

4050-40-60 Directed Readings in Greek (3, 3, 3) F, W, Sp

5010 Special Topics in Greek Literature (3) May be repeated. Maximum 9 hrs.

Latin

3440 Livy (3) A

3460 Elegiac Poets (3) A

4310 Selected Readings from Latin Literature (3) A

4320-30 Selected Readings from Latin Literature (3, 3) May be repeated: A; A

4340 Horace, Odes (3) A

4350 Tacitus (3) A

4360 Lucretius (3) A

4370 Readings in Medieval Latin (3) A

5310 Special Topics in Latin Literature (3) May be repeated. Maximum 9 hrs.

5410-20 The Latin Epic: Lucretius, Vergil (3, 3) A

5510-20 Roman Comedy; Plautus (3, 3) A

GENERAL COURSES

3310 Art and Archaeology of the Aegean Bronze Age and Early Greece (3) Troy, the Cyclades Islands, Greek mainland, and Crete. Emphasis on palaces of Crete and Mycenae. Tiryns, and Pylos, their fall, the following Dark Age, and birth of Greek civilization. Illustrated lectures. W

3340 Cities of the Greek and Roman World (3) Archaeological survey of Greek and Roman cities from 3000 B.C. to 500 A.D. with emphasis on development of city planning and quality of life. Such cities as Mycenae, Athens, Priene, Alexandria, Rome, and Lepcis Magna will be studied. F

3350 Shrines and Sanctuaries of the Greek and Roman World (3) Survey of major shrines and sanctuaries of Greek and Roman world with emphasis on archaeological remains. Such sites as Olympia, Epidaurus, Paestum, Cumae, Paestum, and Baalbek will be considered. Classical authors will add to understanding of place of great shrines and sanctuaries in Greek and Roman life. A

4220 Seminar in Classical Studies (3) Field of classical studies today. Recent research and development in areas of both philology and archaeology; impact of decipherment of Linear B, new understandings of cultural and political "golden ages" of Pericles and Augustus; classical studies and academic profession on both high-school and college levels. May be repeated. Maximum 6 hrs.

4410 Special Topics in Classical Civilization (1-3) Topics in art, literature, religion, and society of Greece and Rome. May be repeated with consent of department. Maximum 9 hrs.

4510 Selected Readings in Latin Literature in Translation (3) Content varies; may be repeated with consent of department. Maximum 9 hrs.

4610 Studies in Classical Archaeology (3) Variable content course offering subject matter not taught in existing course, or concentrating on one aspect of existing survey. Prereq: According to topic. May be repeated. Maximum 9 hrs. A

4620 Roman Law (3) Development of Roman law by jurists; relationship of Roman law to modern economy and society; relationship of Roman law to American jurisprudence. Case-book format. W

5810 Special Topics in Classical Civilization (3) May be repeated. Maximum 9 hrs.

5620 Problems in Old World Archaeology (3) (Same as Anthropology 5620.) A

Computer Science

MAJOR

DEGREE

Computer Science

M.S., Ph.D.

Professors: J. S. Bradley, Acting Head, Ph.D. Iowa (Mathematics, Head); Moorees'Au', Ph.D. Aligarh; J. E. Bloor, Ph.D. Manchester (U.K.) (Chemistry); J. C. Gonzalez, Ph.D. Florida (Electrical Engineering); K. C. O'Kane, Ph.D. Pennsylvania State; G. R. Sherman, Ph.D. Purdue (Director of Computing Center); M. G. Thomason, Ph.D. Duke.


BACKGROUND REQUIREMENTS TO M.S.

The department requires 4 courses for admission to the program to be majoring in computer science.

1. 2610 and 3520 or equivalent courses in advanced programming and assembler language programming.
2. 2215 and 3215 or equivalent courses in discrete structures.
3. 3155 or an equivalent course in introductory numerical algorithms.
4. Mathematical maturity equivalent to that of a student who has completed the calculus sequence through one year of multivariable calculus and matrix algebra.

THE MASTER'S PROGRAM

All students must receive departmental credit for or exhibit proficiency in the following courses:
1. Computer Science 4510, 4550, 5100 and 5109.
2. Electrical Engineering/Computer Science 5175 and 5940.
3. One of the three courses Computer Science 4710, 4730, or 4225.

The department offers two options:

Thesis Option:
1. Complete 45 hours of course work at the 4000 level or above, including at least 33 hours at the 5000 level (no more than 9 hours of which may be thesis hours), but excluding 5100 and 5109.
2. Complete at least 9 hours of thesis credit, Computer Science 5000.
3. Pass an oral examination by a committee of at least three faculty members.

Non-Thesis Option:
1. Complete 45 hours of course work at the 4000 level or above, including at least 33 hours at the 5000 level, but excluding 5100 and 5109.
2. Pass written and oral comprehensive examinations. Under either option, a student wishing to count a course from another department towards the graduate degree must have prior written approval from the computer science graduate committee.

THE DOCTORAL PROGRAM

Entrance Requirements: In addition to the admissions procedures required by the Graduate School, a student seeking admission to the Ph.D. program must:
1. Have three letters of recommendation sent directly to the Department Head from individuals capable of assessing the student's potential for advances in computer science (for example, college teachers, or employers for whom the student has worked after earning a bachelor's degree). The department reserves the right to contact these individuals or other knowledgeable people of additional information is deemed necessary or desirable.
2. Have his/her GRE verbal and quantitative scores sent to the University. The student must take these exams early enough to ensure that the scores are at least three months before the beginning of the quarter in which he/she seeks admission. A minimum score of 40th percentile will be required. Test results should not be more than three years old.
3. Have GRE Achievement Exam score in Computer Science, Engineering or Mathematics sent to the University, subject to the same deadline as (2) above. In lieu of an Achievement Exam score in Computer Science, Engineering or Mathematics, the Department will consider:
   i. An Achievement Exam score in another area, or
   ii. Alternate evidence of achievement in computer science or computer engineering, such as significant work experience in either field, or
   iii. An earned graduate degree requiring substantial computer science coursework. An applicant who wishes to submit an alternate exam score or alternate evidence of achievement must make this request to the department as soon as possible.
4. Satisfy the background requirements for Master's program.

Admission to Candidacy: Admission to the Ph.D. program does not guarantee admission to the Ph.D. degree. Official admission to candidacy is based on the following procedures:

1. The student completes the coursework requirements as defined above.
2. The student completes comprehensive examinations covering three areas selected by the student in advance. Each exam is graded as high pass, pass, low pass, or fail. The student must make a high pass in at least one of the areas and no less than low pass in all other exams. These exams may be taken a maximum of two times, separated by no more than one calendar year; in a second attempt, a student does not have to repeat any area in which a high pass was earned on the first attempt. The CS Graduate Committee administers these exams, which must be passed prior to admission to candidacy and at least three quarters prior to conferred degree. Comprehensive examinations must be taken within five years, and all requirements must be completed within eight years, from the time of a student's first enrollment in the doctoral degree program.
3. The student reaches an agreement with a member of the Computer Science Department's faculty to become the major professor, dissertation director, and chair of the student's committee. The committee must have at least four members, with at least three from the Computer Science Department and at least one holding an appointment in another department. At least three members, including the chair, must be approved by the Graduate Council to direct doctoral research.
4. The student's committee evaluates the student's background and outlines a coherent program of study, which may include additional courses and outside readings in the technical literature. This program is subject to periodic revision within reasonable limits and will be reviewed by the committee no less frequently than once a year (Completion of the entire program is not required before admission to candidacy).
5. In an open, public meeting, the student presents to the committee a survey of current literature in the area of proposed Ph.D. research. A specific dissertation topic is not required at this time; rather, the student is expected to know state-of-the-art work in the general area of interest.
6. The student completes Graduate School requirements for formal admission to candidacy.

Dissertation Proposal: After consultation with the committee and initial investigation of a topic, the student submits a written proposal to the committee and makes an oral presentation of this proposal in a meeting which other faculty may attend. The written version must be typed, conform to high standards of scholarly writing, and contain an overview of previous research in the area of interest. Based on the written and oral presentations, the committee must accept the topic, reject the topic, or modify the topic to make it suitable for doctoral research.

Dissertation and Residency Requirements: The student continuously registers in CS 6000 (minimum of three hours each quarter) from the time the topic proposal is approved, admission to candidacy occurs, or registration for course 6000 is begun, whichever comes first, including the quarter in which the dissertation is accepted by the Graduate School and including the summer quarters. The minimum residency for a doctoral degree is three consecutive quarters of full-time study (minimum of nine hours each quarter) in the graduate program subsequent to admission to candidacy. Part-time enrollment does not count toward this requirement.

Dissertation Defense: The student presents and defends the dis-
sertation in a public meeting. The committee determines Pass or Fail. A student entering the Ph.D. program well prepared to begin research (e.g., a student who has a Master's degree in computer science and an area of research in mind) could complete the program in perhaps three years. A less well-prepared student (e.g., a student entering without a Master's degree but with solid undergraduate experience) might expect to devote five to six years to the program.

New Courses Proposed:
The UTK Computer Science Department currently offers a wide variety of 5000-level courses as part of its Master's degree program. The courses will be the initial basis for admission to doctoral candidacy. In conjunction with admission to candidacy and beyond, 6000-level courses will be added to the curriculum which will prepare advanced students in areas of doctoral research.

3150 Introduction to Numerical Algorithms and Programming (3) Roots of equations, systems of linear equations, least-squares fitting, numerical integration, numerical methods for ordinary differential equations. Introduction to programming in FORTRAN. 3150 and 3155 may not both be taken for credit. Students with a knowledge of FORTRAN should take 3155. Prereq or coreq: Mathematics 2860. (Same as Mathematics 3150.) E

3155 Introduction to Numerical Algorithms (3) Roots of equations, systems of linear equations, least-squares fitting, numerical integration, numerical methods for ordinary differential equations. 3150 and 3155 may not both be taken for credit. Students with a knowledge of FORTRAN should take 3155. Prereq or coreq: Mathematics 2860. (Same as Mathematics 3155.) E


4050 Number Systems for Digital Computers (3) Float and fixed point, direct and mixed radix representation, mixed radix representation, hexadecimal number representation, finite fields and exact computation using digital computers. Prereq: 3155. W

4210 Introduction to Artificial Intelligence (3) Intelligent computer programs constructed by computer representation of knowledge, problem solving and search, game playing, automated deductive systems, natural language understanding, computer vision and learning. Computer implementation of AI problems. Prereq: 4510. W

4225 Numerical Solutions to Equations and Numerical Approximations (3) (Same as Mathematics 4225.) F, W

4235 Numerical Methods for Ordinary Differential Equations (3) (Same as Mathematics 4235.) F, W

4245 Numerical Linear Algebra (3) (Same as Mathematics 4245.) F, Sp

4310 Statistical Data Processing (3) FORTRAN language for organization and analysis of scientific data. SPSS and SAS programs for standard statistical inference, confidence intervals, mixed-rank randomization, data reduction correlation and regression, analysis of variance. Not for credit for computer science majors. Prereq or coreq: Statistics 2515. F, Sp

4330 Independent Study in Computer Science (1-5) Special project in area of student's primary interest. To be directed by Computer Science faculty, perhaps jointly with student's faculty advisor. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

4470 Programming Languages (4) Comparison and analysis of programming languages, design, features, and applications. Processors, operations, sequence control, data control, and storage management. Detailed discussion and programming experience with FORTRAN and other SNOBOL, APL, or SIMULA. Prereq: 4510.

4510 Data Structures and Non-Numeric Programming (3) Data structures and algorithms for their manipulation. Arrays and orthogonal lists; stacks, queues, rings, hash tables; trees, dynamic storage allocation; organization of files, programming languages for information structures. Prereq: 1620 and 2610. E

4550 Systems Programming (3) Computer organization and design of computers, representation of information, microprogramming, software systems, input/output systems, interpreters, macro assemblers. Prereq: 3520 or equivalent. E

4670 Introduction to Data Base Management Systems (3) Hierarchical, network, and relational models. Logical and physical views of data. Data definition and data manipulation languages. Data independence. Implementation and operational considerations: performance, integrity, security, and reliability. Prereq: 4510. F. 4570 and 5570 may not both be taken for credit.

4590 Advanced Systems Programming (3) Multitasking, overlays, advanced I/O techniques, high-level language macros, interrupt handling, multithreaded facilities, virtual systems (all in a high-level language), and OS utilities. Prereq: 4510 and 4550. F

4610 Introduction to Operating Systems (3) Detailed examination of major operating system. Memory, processor, device and data management. Interrupts, machine-level input/output, loaders and relocation, device characteristics, data set organizations, SPOOLing. Prereq: 4510 and 4550. 4570 and 5570 may not both be taken for credit.

4660 Principles of Compiler Design (3) Techniques of compiler design, scanning and parsing of languages described by regular and context-free grammars. Prereq: 4510 and 4710. Sp

4710 Formal Languages and Automata (3) Grammars of Chomsky hierarchy and their recognizable properties. Languages and machines. Emphasis on regular and context-free languages, introduction to context-sensitive languages. Prereq or coreq: 4510, 2715. F, Sp


4750 Interactive Computer Graphics (3) Point plotting, vector generation, interactive graphical techniques, two- and three-dimensional transformation, perspective depth, hidden line elimination, shading, software and hardware system design. Discussion of use of these techniques in design, problem solving, mapping, architecture, and many other areas. Prereq: Senior standing in Computer Science, Electrical Engineering or Geography and a knowledge of computer programming or consent of instructor. (Same as Geography 4750 and Electrical Engineering 4750.) E

4820 Introduction to Pattern Recognition (3) (Same as Electrical Engineering 4820.) W

4830 Digital Image Processing (3) (Same as Electrical Engineering 4830.) E

4850 Small Computer Systems (3) (Same as Electrical Engineering 4850.) E

4910 Analysis and Management of Computer Installations (3) Design, planning, and operation of computer systems: implementation, justification, personnel in systems, perspective on systems. Prereq: 3520 or equivalent. W

4800 Special Topics in Computer Science (1-4) Credit determined at registration. Prereq: May be repeated with consent of department. Maximum 9 hrs.

5000 Thesis (1-15) P/NP only. E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student utilizes University facilities beyond the undergraduate level. Maximum 9 hrs. may not be used toward degree requirements. May be repeated. S/NC only. E

5005 Computer Modeling and Simulation of Physical Systems (3) Techniques for computer modeling and simulation, inputs, driving functions, error outputs, interactive simulations as applied to various physical systems. Models to represent spatial relationships. Prereq: 3150 or 3155, and 3920 and introduction to probability.

5100 Immigration to Computer Science (5) Designed for graduate students with limited computer science background who wish to enter computer science major or minor program. Advanced computer technology; control of input-output devices; machine organization and assembly language programming; introduction to data structures and algorithm analysis. Prereq: One course in programming. F

5109 Immigration to Computer Science Practicum (2) Design and implementation of medium to large scale computer programs. Prereq: 2715 or 4510. W

5130 Introduction to Research Computing Systems (3) VAX 11/780 architecture, operating systems (VMS, UNIX, RSX, TSO), utilities (RMS), editors, macro assemblers, high level language interfaces, interface monitoring, and the DEC PCD-350 architecture and facilities; survey of existing research applications involving VAX, PDP-11, NCR 1632 and related systems. Prereq: 4550 or 4580, or consent of instructor.

5175 Introduction to Logic Design (3) (Same as Electrical Engineering 5175.)

5210 Artificial Intelligence (3) Simulation of intelligent processes by computer. Techniques of representation, search, and manipulation for various areas: problem solving, game playing, pattern perception, theorem proving, semantic information processing. Computer simulation of AI problems. Prereq: 4510 or consent of instructor. (Same as Electrical Engineering 5090.) W

5250 Medical Computing (3) Achievements and problems associated with application of computer technology to field of health care. Various areas of medical computing: laboratory data systems, patient monitoring systems, diagnostic assistance, patient records, automatic history taking, and hospital administration systems. Prereq: 4510. Sp

5310 Computer Networks (3) International Standards Organization open system interconnection model function and protocols. Analysis of model as it applies to LAN technologies, particularly Ethernet (ARPANET, SNA, DECENT, and X.25) and major local networks (ETHERNET). Prereq: 4510 and 4550.

5340 Advanced Compiler Design (3) Design and implementation of compilers, affects and two-level optimization, preprocessors, compiler-compilers, incremental compilation, run-time organization, data flow analysis, optimization, and error recovery. Prereq: 4860.

5455 Finite Difference Methods for Partial Differential Equations (3) (Same as Mathematics 4545.) F

5465 Finite Element Methods (3) (Same as Mathematics 5465.) W

5475 Advanced Topics in Numerical Partial Differential Equations (3) (Same as Mathematics 5475.) Sp

5570 Database Management Systems (3) Data model theory, comparison of several existing data base systems, implementation technology, selection and evaluation techniques, integrity, security, authorization and protection, hardware architectures, and future trends in DBMS area. 4570 and 5570 may not both be taken for credit. Prereq: 4510. W

5655-65-75 Numerical Mathematics (3, 3, 3) (Same as Mathematics 5655-65-75-75.) F, W, Sp

5670 Operating Systems (3) Detailed examination of
major operating system. Memory management, dispatchers, interrupts, device characteristics, theory and practice, interprocess communication, implementation of portions of multuser operating system. Prereq: 4510 and 4550 or equivalent, or consent of instructor. 4610 and 5670 may not both be taken for credit.

5680 Case Studies in Operating Systems (3) Examination of different operating systems. Operating system design, alternative strategies for memory, device and CPU allocation and management; protection, time sharing, real-time systems. Prereq: 4510 or 5670 or consent of instructor. W


5730 Computability and Computational Complexity (3) Computability and decidability, Turing machines and halting problem. Register machines. Recursive and recursively enumerable sets; partial and total recursive functions. Time and space bounded computations; the P vs NP problems. Prereq: 4710. A

5750 Theory of Formal Languages (3) Phrase-structure languages, their generators and processors. Type 0, 1, 2, and 3 languages, operations on languages and grammars; deterministic context-free languages. Theory of translation. Prereq: 4710. W

5790 Computer Architecture (3) Elements, major components, Storage components and tradeoffs; size, speed, virtual storage, cache storage. Processor organization, instruction set organization, stack machines, pipelining, overlap and vector processors. Operating system considerations. Prereq: 5560 or 5940.


5940-50 Patern Recognition (3, 3) Prereq: 3150, Statistics 3450 and Mathematics 4050 or equivalent. (Same as Electrical Engineering 5670-80.) F, W

5860 Data Security (3) Need for security and methods for achieving it; encryption, machine architecture, hardware and software implementations, historical and current approaches. Case studies in fraud and misuse. Prereq: 3520 or consent of instructor.

5910-20-30 Special Topics in Computer Science (1-6, 1-6, 1-6) May be repeated. Maximum 9 hrs.

5940-50 Advanced Small Computer Systems (3, 3) (Same as Electrical Engineering 5940-50.) Prereq: EE 5175 or 4850.

5970 Independent Study in Computer Science (1-3) Special project under faculty guidance. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

6000 Doctoral Research and Dissertation (3-15) Ph.D. only. Prereq: May be repeated with consent of instructor.

6210 Advanced Topics in Artificial Intelligence (3) Issues of knowledge organization, knowledge representation and problem solving that underlie the design of expert systems. Analytical and design techniques used in implementing non-trivial expert systems. Prerequisite: consent of instructor.

6570 Advanced Topics in Database Management Systems (3) Advanced topics concerning normalization, query optimization, database security and integrity in data base systems. Prerequisite: consent of instructor.

6870 Advanced Topics in Operating Systems (3) Advanced topics in operating systems including device drivers and interface to computer networks. Prerequisite: consent of instructor.

6730 Advanced Topics in Computer Science (3) Advanced topics in computability and decidability. Prerequisite: consent of instructor.

6750 Advanced Topics in Formal Languages and Automata (3) Advanced topics concerning formal languages and automata. Prerequisite: consent of instructor.

6810 Advanced Topics in Information Storage and Retrieval (3) SMART and SIRE system, system evaluation methodology, file clustering, dynamic query reformulation, information retrieval processing, natural language processing. Prerequisite: consent of instructor.

6910 Advanced Topics in Computer Science (3) Advanced topics is forum for graduate students individually or in groups. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs.

Cultural Studies

Afro-American Studies

3140-50-60 Directed Readings in Afro-American Studies (1, 1, 1) Designed for students who are interested in doing intensive reading in some area of Afro-American Studies which is defined by the student and the instructor. Prereq: 2010 or 2020 and consent of instructor.

3530 Peoples and Cultures of Africa (3) (Same as Africana Studies 4530) Prereq: Africana Studies 4530. Consent of instructor.


4250 History and Philosophy of Afro-American Education (4) Attempt by Afro-Americans to secure an education for themselves and their children from era of slavery to Supreme Court decision of 1954. Black perceptions of importance of education and special obstacles confronting blacks who tried to get an education. (Same as Curriculum & Instruction and History 4292.)

4310 Research in Afro-American Studies (4) Dealing with Black experience and research process.

4500 Issues and Topics in Afro-American Studies (3-4) Problems, topics and issues in area of Afro-American Studies. Content and credit determined by instructor. May be repeated. Maximum 12 hrs.

4610 African Prehistory (3) (Same as Anthropology 4610.)

5830 Afro-American Women in American Society (4) Historical and contemporary social, economic and political factors in American society as they relate to the Black woman. (Same as Women's Studies 4830.)

6880 Afro-American Psychology (3) (Same as Psychology 4880.)

4950 The Afro-American Experience to 1865 (3) (Same as History 4950.)

5960 The Afro-American Experience Since 1865 (3) (Same as History 4960.)

Asian Studies

3670 Islamic Literature in English Translation (4) Survey from origins to modern period of major Islamic literatures, especially Arabic, Persian and Turkish. Readings include The Arabian Knights, The Rubaiyat of Omar Khayyam and Gibran's The Prophet.

4010-20-30 Readings in Asian Literature (4, 4, 4) (Same as English 4010-20-30) Prereq: Mastery of intermediate level of Japanese, Chinese, Sanskrit, or Arabic and consent of instructor.

4012 Selected Topics in Asian Studies (4) Content varies. May be repeated. Maximum 12 hrs.

4431-32-33 Advanced Modern Standard Arabic I, II, and III (4, 4, 4) Readings in essays by modern Arab writers dealing with 20th century issues. Written and oral exercises over points of grammar and syntax that occur in essays. Prereq: 4311-32-33 or consent of instructor.

4434-35 Spoken Lebanese/Palestinian Arabic I, II (4, 4) Aural-oral introduction to central dialect of Arabic-speaking world. Prereq: 2431-32-33 or consent of instructor.

4531-32-33 Advanced Chinese (4, 4, 4) Prereq: 3531-32-33 or equivalent of consent of instructor. Must be taken in sequence.

4631-32-33 Advanced Japanese (4, 4, 4) Reading in graded primer with attention paid to finer points of grammar. Conversation, drill and composition practices with native speaker. Must be taken in sequence. Prereq: 3631-32-33.

Comparative Literature

4012-22-32 Special Topics in Comparative Literature (3, 3, 3) Content varies. May be repeated. F, W, Sp

4050-60-70 Dante and Medieval Culture (3, 3, 3) (Same as Italian 4050-60-70.) A, A, A

5012 Comparative Theories of Literature (3) Croce, Richards, Frye, Wedek and others. Prereq: Completion of two literature courses in foreign language about Greek or Latin author.

5022 Approaches in Comparative Literature (3) French and American schools; "comparative literature" vs "general literature"; Van Tieghem, Carre, Balderas, Wedek. Prereq: 5012; completion of three literature courses in foreign language above 3000, or equivalent. W

5023 Studies in Comparative Literature (3) Independent research projects. Prereq: 5012 and 5022. Sp

Cultural Studies

5101 Foreign Study (1-12) See page 104.

5102 Off-campus Study (1-12) See page 104.

5103 Independent Study (1-12) See page 104.

Latin American Studies

4001 Cultural Plurality in Latin America (3) Value systems and behavioral patterns based on Spanish-Mediterranean, Luso-Mediterranean, indigenous Indian and African heritage existing today in Latin America. Prereq: Consent of instructor.

4002 Institutional Changes in Latin America (3) Government, political parties, role of military, Church, educational institutions, democracy and dictatorship, nationalism, and family. Evolution of institutions in Latin and Hispanic America. Prereq: Consent of instructor.

4970 Latin American Studies Seminar (3-4) May be repeated with consent of instructor. Maximum 8 hrs.

Linguistics

4000 Topics in Linguistics (3) Content varies. May be repeated. Maximum 9 hrs.

4120-30 Foundations of Linguistics Science, Devel- opment of Methodology, Contemporary Theory (3, 3) Intellectual and methodological foundations of linguistics science. Changes in linguistic interest brought about by Saussure's Cours and the growing impact of other disciplines on linguistics science. (Same as English 4120-30.)

4250 Introduction to Descriptive Linguistics (3) (Same as French, German, Russian, Spanish 4250.)

4260 Introduction to Historical and Comparative Lin- guistics (3) (Same as French, German, Russian, Spanish 4260.)

4270 Introduction to Romance Linguistics (3) (Same as French, Spanish 4270.)

4271 Introduction to Slavic Linguistics (3) (Same as Russian 4271.)

4440 Sociolinguistics (3) (Same as English 4440.)

4460 Special Topics in English Linguistics (3) (Same as English 4460.)
THE MASTER'S PROGRAM

The departmental requirements for the M.A. degree in English include (1) thesis and 36 quarter hours of courses in the Department of English or 45 quarter hours without a thesis, (2) evidence of proficiency in one foreign language, and (3) a final oral examination for thesis students, written and oral for non-thesis students. The courses should include 12 hours at the 6000 level, 12-21 additional hours of courses at the 5000-6000 level, and 12 hours at the 5000 level for graduate credit, including the 3000-4000 level. A reading list is in the office of the Director of Graduate Studies in English.

The M.A. with writing option is intended for those who plan to do free-lance writing, specialize in teaching writing courses at the college level, or work as professional writers in business or industry. Students who go on to complete the Ph.D. may also find the M.A. with writing option helpful when they are seeking teaching positions.

1. A minimum of 36 quarter hours beyond the B.A. degree.
   a. 12 hours at the 6000 level.
   b. 12 additional hours at the 5000-6000 level. (A student may take only three hours of 5100 Independent Study toward the degree.)
   c. 12 hours for graduate credit at any level, including the 3000-4000 level.

A student must take at least 15 hours in writing and 15 hours in literature, the remaining 3 hours to be selected from any English course at the proper level. Of the courses in writing, at least 9 hours must be taken at the 5000 level.

2. Students in the M.A. with writing option may choose one of the following writing projects in consultation with a project director and faculty committee:
   a. A thesis, using research to analyze some aspect of writing or rhetorical theory, for which 9 hours credit is given.
   b. A creative project, for which 9 quarter hours credit is given. A collection of poems or short stories, a short novel, a play, or a creative work of non-fiction prose would be acceptable as creative projects.

3. A final oral examination consisting chiefly of questions covering the general history and interpretation of English and American literature. A reading list may be modified by the M.A. examining committee, meeting in a body with the student, to reflect the candidate's particular writing emphasis, but most of the oral examination should focus upon the literature outlined in the original reading list.

4. Evidence of proficiency in one foreign language.

THE DOCTORAL PROGRAM

The departmental requirement for the Ph.D. degree in English is completion of a minimum of three academic years of resident graduate study. This includes a balanced program of at least 72 quarter hours (or the equivalent) in English: 36 hours at the 6000 level; 24 additional hours at the 5000-6000 level; and 12 hours for graduate credit at any level, including the 3000-4000 level. In addition, 5 to 12 selected from any level approved by the department must be taken for graduate credit in a subject or subjects other than English. Normally a student with the M.A. from another university may transfer at least 36 quarter hours.

After all, or most of the course work has been taken and after the two language requirements have been satisfied, the student will take the General and Language Examinations from several areas divided as the department directs. Successful completion of these examinations will be followed by the writing of the dissertation and by an oral examination in the field of the dissertation.

Any course in the 5000 or 6000 series may be repeated for credit with the permission of the department.

*1211 Written and Oral English for Foreign Students (6) Rapid review of English grammar structures and pronunciation with intensive oral, aural, and written drill. Required during the first quarter of residence of all foreign students (graduates, undergraduates and transfer students) who are not excused from it on the basis of the English Proficiency Examination required of every new foreign student. A, B, C, I, F, W grading. Students registered for this course are permitted to register for only 2 other courses.

*1221 Written and Oral English for Foreign Students (6) Emphasis on the more advanced structures of English grammar and on paragraph writing. Required during the first quarter of residence of foreign students who on the English Proficiency Examination demonstrate need for work in English structure, but not at the intensive level of English 1211. Required also of foreign students who complete 1211. A, B, C, I, F, W grading. Students registered for this course are permitted to register for only 2 other courses.

3070 Modern British Poetry (3) From Housman to Thomas and more recent poets.

3080 Modern American Poetry (3) From Robinson to Stevens and more recent poets.


3145 Tennyson and His Successors (3) Includes such poetry as that by the Pre-Raphaelites, humorists, and Decadents.

3150 Browning, Arnold, and Hopkins (3)

3150 Melville (3)

3210-20 English Literature and Culture of the Nine-teenth Century (3, 3) Survey of literature dealing with leading movements in politics, science, religion, and the arts. 3210—1800 to 1835. 3220—1835 to 1890.

3411-12-20 Modern Drama (3, 3, 3) 3411— Continental to 1930. 3412—Continental since 1930. 3420—British. 3430—American.

3510 Sixteenth-century Prose and Poetry (3) More and Wyatt to Spenser. A

3520 Elizabethan Drama (3) Marlowe, Jonson, and others. A

3510 Restoration and Eighteenth-century Poetry (3) Emphasis upon Dryden and Pope.

3520 Restoration and Eighteenth-century Drama (3) Dryden through Sheridan.

3530 Restoration and Eighteenth-century Prose (3) Defoe, Addison, Steele, Swift, and others.

3670 The Age of Johnson (3)

3710 Literature of English Bible (3) Types of Old Testament literature, excluding Wisdom literature. A
of general development and basic texts of Science Fiction, Speculative Fiction and Fantasy. Exercises in writing in genres, in accordance with techniques learned in basic Writing Fiction course.

4270 Advanced Poetry Writing (3) Further development of skills in basic Writing Poetry course. Prereq: 3470 or consent of instructor.

4310-20-30-40 The British Novel (3, 3, 3, 3) 4310—Defoe to Jane Austen; 4320—Scott to Thackeray. 4330—George Eliot to Galsworthy. 4340—James Joyce to present.

4440 Sociolinguistics (3) Study of language in relation to society. Methodological and theoretical study. Emphasis both on individuals and on large-scale social units: tribes, nations, and social classes. Prereq: 3330 or Linguistics 200 or consent of instructor.

4450 Dialectology (3) Theories and methodologies of dialect research, fieldwork, and analysis. Prereq: 3340 or consent of instructor.

4455 American Dialectics (3) Characteristics of major regional and social dialects of American English. Their origins and functions. Implications for cultural pluralism. Prereq: 3330 or Linguistics 200 or consent of instructor.

4460 Special Topics in English Linguistics (3) May be repeated with consent of department. (Same as Linguistics 4460.)

4461 Quantitative Analysis of Language (3) Techniques of studying languages both in spoken language and in written texts, including literature. Identifying questions, collecting, analyzing, and interpreting data implications for linguistic and/or literary theory. Prereq: 3330 or Linguistics 200 or consent of instructor.

4471-81 English as a Second or Foreign Language (3, 3) 4471—Applied linguistics in teaching and learning of English as a second or foreign language. Phonological and grammatical structure of present-day English. Analysis of differences (phonological, grammatical) between English and another language. Prereq: Second year of a foreign language. 4481—Materials and methods of language teaching, with emphasis on preparation of materials and structured teaching situations. Theory of testing language competence and performance, with emphasis on construction of tests. Team teaching with an experienced member of the staff. Prereq: 4471. (Same as Linguistics 4471-81) W; Sp

4510-20 Black Literature (3, 3) Trends and developments.

4640 Black American Literature and Aesthetics (3) Examination of black texts in Black American Literature and Aesthetics since 1899. Emphasis on more recent works.

4651 Southern Literature through the Nineteenth Century (3) Southern writing from colonial period to end of nineteenth century, including frontier humerous and local color writers. A

4652 Southern Literature in the Twentieth Century (3) Modern Southern literary renaissance, the Fugitives and Agrarians, Faulkner and more recent writers such as Welty, O'Connor, and Porter. A

4660 Emerson and Thoreau (3)

4680 American Humor through Mark Twain (3)

4721-31-41 Ballad and Folktales (3, 3, 3) 4721—Study of traditional English and Scottish popular ballads and their North American variants; 4731—Study of native American ballad and folktales; 4741—The folk narrative; functions, categories, and patterns of storytelling.

4850 Milton (3) Emphasis on major poems. A

4860 Seventeenth-century Prose and Poetry (3) Bacon and Donne to Marvell. A

4930-40 Chaucer (3, 3) 4930—The Canterbury Tales. 4940—Troilus and Criseyde and early poetry.

5000 Thesis (1-15) P/NP only. E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities after the degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5101 Foreign Study (1-12) See page 104.

5102 Off-campus Study (1-12) See page 104. E

5103 Independent Study (1-12) See page 104. E

5140 Teaching Freshman Composition (3) Introduction to teaching of Freshman English through study of various techniques and philosophies of composition. Required of all first-year teaching assistants. F

5150 Old English Prose (3) A

5170-80 History of the English Language (3, 3) 5170—Phonetic transcription, Old English, development of inflection and syntax. 5180—Middle and Early Modern English, developments in pronunciation and vocabulary. F; W

5210-20-30 Reading in American Literature from the Colonial Period to the Present (3, 3, 3) F; A; W; Sp, A

5240 Readings in Black American Literature (3) Critical analysis of poetry, prose, drama, criticism; historical and cultural background; discussion of relevance or irrelevance of race as influence on text and reader.

5250 Fiction Writing (3) Advanced fiction projects, under supervision of instructor and time for independent study. Prereq: Extensive background in reading and writing fiction.

5255 Writing of Advanced Non-Fiction Prose: The Genres (3) Practice in writing of biography, travel book, historical study, and associated genres. Viewpoint is creative. Prereq: 4000-level writing course or consent of instructor.

5270 Poetry Writing (3) Major poetic project or continuation of project begun in 4270. Individual consultation with instructor supplements class analysis; readings in contemporary poetry and theory. Prereq: 4270 or consent of instructor.

5280 Special Topics in Writing (1-3) Topic varies. May be repeated. Maximum 9 hrs. Enrollment by consent of Director of Graduate Studies only.

5290 Analysis of Technical Writing (3) Theory and practice of technical writing. Exploration of current theories of scientific, business, technical, academic, and government rhetoric. Analysis of shared elements and practices in producing such writing. Prereq: 4140 or consent of instructor.

5310 Rhetoric and Composition: History and Theory (3) Modern developments in rhetorical theory, their origins in Plato, Aristotle, and others.

5410-20 Readings in Middle English Literature (3, 3)

5510-20 Readings in Literary Criticism from Plato and Aristotle to the Present Day (3, 3)

5610-20 Reading in English Literature of the Nineteenth Century (3, 3, 3) 5610—The Nineteenth Century: Antiquity through the Industrial Revolution; 5620—The Nineteenth Century: Poetry, drama, fiction, philosophy; 5630—The Nineteenth Century: Professional life and intellectual movements, 5640—The Nineteenth Century: Art, culture, politics;

5650 Film History, Rhetoric, and Criticism (3) Film as narrative art form; historical development of film; the "rhetoric" of film; critical approaches to film study, including genre, auteur, formalist, and historical; critical analysis of individual films.

5710-20 Readings in English Literature of the Eighteenth Century (3, 3, 3)

5720-30 Readings in English Literature of the Eighteenth Century (3, 3, 3, 3)

5800 Introduction to Literary Research (3) Critical examination of aims of English studies, profession of English teacher, theory of literature, and methods of research, including collection of data, documentation, evaluation of material, and transmitting of results of scholarship.

5910-20-30 Readings in English and American Literature of the Nineteenth Century (3, 3, 3)
Geography/College of Liberal Arts

6100 Doctoral Research and Dissertation (3-15) P/ NP only. E
6110-20-30 Studies in Elizabethan Literature (3, 3, 3) A
6140 Studies in Old English Language and Literature (3) For students who know Old English well and who wish to do research in literature, structure of language, paleography, Anglo-Latin backgrounds and sources, and related topics.
6150 Old English Poetry (3) Prereq: 5150.
6160 Becoulf (3) Prereq: 5150, 6150.
6170 Studies in Middle English (3)
6181-82-83 Studies in English Language (3, 3, 3)
6190-91 Studies in Middle English (3)
6192-93 Studies in English Romanticism (3, 3)
6194-95 Studies in Roman Romance (3, 3)
6241-42 Studies in Colonial American Literature (3, 3) 6241—From Thomas Harriot through Increase and Cotton Mather. 6242—From Jonathan Edwards to adoption of Constitution.
6270-80 Studies in American Fiction (3, 3)
6310-20-30 Studies in Victorian Literature (3, 3, 3)
6410-20-30 Studies in Chaucer (3, 3, 3)
6510-20-30 Studies in Spenser and Milton (3, 3, 3)
6550 Studies in Mode and Genre (3) Content varies. May treat drama, novel, short story, poetry, or satire, the comic, the tragic, etc., depending on professor.
6590 Special Topics (3) Content varies. Humor, history of ideas, biography, autobiography, literature of travel, literature and extra-literary disciplines, etc.
6610-20-30 Studies in English Romanticism (3, 3, 3)
6670-80-90 Studies in Eighteenth-century Literature (3, 3, 3)
6690-10-20 Studies in Drama and Theatre (3, 3, 3)
6860 Textual Bibliography and Criticism (3) Study of evidence gathered from printing process to make critical judgments about text of literary work. Prereq 5860 or consent of instructor.
6910-20-30 Studies in Twentieth-century Literature (3, 3, 3)

French
See Romance Languages

Geography

MAJOR

DEGREES

Geography
M.S., Ph.D.

Professors: S. R. Jumper (Head), Ph.D. Tennessee; C. S. Aiken, Ph.D. Georgia; T. L. Bell, Ph.D. Iowa; E. H. Hammond, Ph.D. California (Berkeley); C. W. Minkel, Ph.D. Syracuse; C. T. Paludan, Ph.D. Denver (UTSI); T. H. Schmude, Ph.D. Wisconsin; T. J. Wilbanks (Adjunct), Ph.D. Syracuse.

Associate Professors: I. W. Breckinridge, Jr., Ph.D. Wisconsin; J. R. Carter, Ph.D. Georgia; B. Flaschen, Ph.D. Northwestern; J. B. Rehder, Ph.D. Louisiana State.

Assistant Professors: T. J. Blasing (Adjunct), Ph.D. Wisconsin; R. Foresta, Ph.D. Rutgers; J. Pulsipher, Ph.D. Southern Illinois.

The Department of Geography offers the degrees of Master of Science and Doctor of Philosophy in Geography with concentrations in geography of development, physical geography and human geography, urban geography, geography of Anglo-America, and rural and nonmetropolitan geography.

THE MASTER'S PROGRAM

The department offers both the thesis and non-thesis options for the Master of Science degree. Both options require a minimum of 45 quarter hours beyond completion of a sound undergraduate major program. At least two-thirds of the total hours in the graduate program must be at or above the 5000 level, and must include 5100 (at each offering during residency), 5150, 5160 and 6 quarter hours at the 6000 level. In the thesis option, no more than 9 hours may be thesis courses. A final examination is required in both programs.

THE DOCTORAL PROGRAM

The doctorate is a research degree and is granted only to those persons who demonstrate proficiency in conducting independent research. Students must have achieved the equivalent of a comprehensive Master's program before they will be admitted to the doctoral program. Course requirements for the degree shall be determined by the student's faculty committee in accordance with specific interests and needs. The program of study must include sufficient course work within the department, but outside the areas of specialization, to give a broad foundation and understanding of the discipline. The program must include 5160, 5170, 5720, and (at each offering during residency) 5100. A minimum of 15 hours of credit must be earned in related fields outside the department. Competence in a foreign language, cartography, and quantitative techniques is required. Other techniques pertinent to the student's areas of specialization may be required. The language will be French or German unless otherwise approved by the student's faculty committee. Examinations required for admission to candidacy include a written comprehensive, written examinations on two special fields, and an oral examination on the student's program, the special fields, and the dissertation proposal. Also required is a final oral examination on the dissertation and on other aspects of the program as determined by the student's dissertation committee.

3410 Intermediate Economic Geography (4) Concepts, theories, and practices in location planning. Locational patterns in agriculture, manufacturing, and service activities. W or Sp

3430 Urban Geography (4) Concepts and theories concerning development and significance of systems of cities and internal morphology of cities. W or Sp

3450 Rural Geographies (4) Geographical appraisal of rural areas of the United States, including small towns and urban fringes. Problems and potentials of rural America. F or W

3450 Geography of Resources (4) Study of factors related to variations in resource availability from time to time and from place to place, with particular emphasis upon energy and metallic resources. F or Sp

3250 Climatology (4) General circulation system leading to world patterns of climate. Climatic change and modification in relationship of climate and human activity. W or Sp

3530 The Land-Surface System and Man (4) Nature and regional variations in relationships among surface form, water, vegetation, and surface materials. Humans as evaluators and agents of change. F, Su

3610 Political Geography (4) Importance of geographical factors for understanding political relationships within and among nations: spatial implications of political decision-making processes, geography of administrative units. F

3650 Cultural Geography (4) Basic concepts of culture; methods and basis of cultural geography; world patterns of cultural phenomena. Sp

3790 Geography of Middle America (4) Covers Mexico, Central America, and the West Indies. F

3800 Geography of South America (4) W

3870 Geography of Asia (4) A survey of the physical, cultural and economic characteristics of the countries of Asia, excluding the Soviet Union.

3910 Regional Geography of United States and Canada (4) Major physical, economic, and social distributions as they intersect with distinctive characteristics of regions of the United States and Canada. F

3920 Geography of the American South (4) Geographical appraisal of southeastern United States, including physical characteristics and human origins. Origin and development of contemporary economic and cultural traits of the area. W

3940 Geography of Appalachia (4) Interrelation of physical, economic, and social patterns that give distinctive character to the region and its parts, especially Southern Appalachia. Appalachia in perspective in the current American scene. F

4070 Geography of Transportation (4) Geographic examination of transportation systems, emphasizing transport of people and goods by public facilities. Relationship of these systems to changing geography of cities and urban hinterlands. Sp

4100 Quantitative Methods in Geography (4) Geographic applications of statistical techniques, point pattern analysis and analysis of areal units. Prereq: Mathematics 3000 or consent of instructor. W

4120 Problems in Geographic Method (4) Examples of problems and approach in geographic analysis and synthesis. Emphasis on character of geographic data, areal sampling, generalization, classification, regionalization, and questions of scale.

4240 Historical Geography of the United States (4) Survey of changing human geography of United States during four centuries of settlement and development. Emphasis upon changing population patterns, development of agricultural regions and patterns of urban development. Sp

4510 Principles of Geomorphology (4) (Same as Geol 4510)

4550 Geography of Solos (4) Solos as physical systems and their relationship to environments. Investigation of specific cases of the role of soil in management of environmental systems.

4710 Cartographic Design and Production (4) Principles and practices of design, construction, and reproduction of maps. Recommended prereq: 3700. 2 hrs and 2 labs.

4720 Data Mapping (4) Automated techniques of representing surfaces, using geographic information system and global positioning system. Recommended prereq: 3700 and knowledge of a computer language. F

4730 Advanced Cartography (4) Map production from design through color proofs. Prereq: 3700, 4710, and 4726 or consent of instructor. Sp

4740 Remote Sensing: Types and Applications (4) Basic principles and uses of aerial photography and other remote sensing techniques. Emphasis upon use of various types of imagery for geographic interpretation and land-use mapping. Prereq: Consent of instructor. For S, Sp

4750 Interactive Computer Graphics (3) (Same as Computer Science 4750)

4793 Practicum in Cartography/Remote Sensing (2-6) Prereq: Written consent of instructor required prior to registration. May be repeated. Maximum 6 hrs. E

5000 Thesis (1-15) P/NP only. E

5002 Non-Thesis Graduation Completion (3-15) Required for non-thesis students. Registration during any quarter when such a student uses university facilities and/or faculty time before degree
is complete. May not be used toward degree requirements. May be repeated. S/NC only. E

5100 Colloquium in Geography (1) Discussion of departmental research, current literature, and general topics. Registration at each offering required of resident graduate students. May be repeated. Maximum 8 hrs credit. F

5101 Foreign Study (1-12) See page 104. Prereq: Written consent of instructor prior to registration. E

5102 Off-campus Study (1-12) See page 104. Prereq: Written consent of instructor prior to registration. E

5150 Introduction to Geographical Research (3) Aims of geographical research; survey of printed source materials; practice in effective presentation of research findings. F

5160 Research Design and Field Problems (4-6) Development of research problems, preparation of appropriate study designs, and practical field application. Su

5170 Geographic Concept and Method (3) Traditional and modern thought regarding the nature, scope, problems, and methods of geography. A

5200 Special Problems in Geography (2-6) Reading and research on problems or topics of interest to individual students. Students must define topic and receive instructor's approval of study plan before registering for course. May be repeated with consent of instructor prior to registration. May be repeated with consent of instructor. Maximum 9 hrs. A

5250 Topics in Historical Geography (3) Examination of trends, concepts and methods in historical geography. Prereq: 4640 or consent or instructor. May be repeated with consent of instructor. Maximum 9 hrs. A

5260 Advanced Cultural Geography (3) Geographic analysis of rural settlement in Eastern United States, with emphasis upon New England, Tidewater East, and Upland South, and specific application to Southern Appalachians. Includes field work and final paper. Prereq: 3600 or consent of instructor. A

5310 Topics in Regional Geography of the United States (3) Intensive analysis of problems and trends in one or more regions of United States, excepting American South. May be repeated with consent of instructor. Maximum 9 hrs. A

5320 Topics in the Geography of the American South (3) Geographic perspective on economic and cultural aspects of southeastern United States. Topics vary. May be repeated with consent of instructor. Maximum 9 hrs. A

5410 Advanced Topics in Economic Geography (3) Examination of trends, problems, and methods in modern economic geography. Prereq: 3410 or consent of instructor. May be repeated. Maximum 9 hrs. A

5520 Advanced Urban Geography (3) Analysis of research on urban systems, internal morphology, urban problems, and urban spatial behavior. Prereq: 3430 or consent of instructor. A

5550 Topics in Geography of Land-Surface System (3) Examination of trends, problems, and methods in geography of land-surface system. Prereq: 3250 or consent of instructor. May be repeated with consent of instructor. A

5610 Topics in Climatology (3) Examination of trends, problems, and methods in modern climatology. Prereq: 3520 or consent of instructor. May be repeated with consent of instructor. A

5660 Advanced Political Geography (3) Geographic consequences of public decisions, emphasis on understanding how political and social processes affect public land management, spatial distribution of public goods, and urban morphology. Prereq: 3610 or consent of instructor. A

5710 Seminar in Geography (3)

5720 Topics in Quantitative Geography (3) Multivariate analysis applied to problems in geography; research problems utilizing appropriate packaged computer programs; usefulness to geographic research of techniques developed by other disciplines. Prereq: 4100 or consent of instructor. Sp

5740 Advanced Topics in Remote Sensing (3) Applied research using remote sensing and aerial photography for interpretation and mapping of geographic data. Prereq: 4740 or consent of instructor. A

5750 Topics in Cartography (3) Trends, concepts, problems, and methods in cartography. Prereq: 4730, or consent of instructor. May be repeated with consent of instructor. Maximum 8 hrs. A

5799 Advanced Practicum in Cartography/Remote Sensing (2-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

5915 Regional Geomorphology (4) (Same as Geology 5915.)

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6110-20 Seminar in Economic Geography (3, 3) A

6220-30 Seminar in Urban Geography (3, 3) A

6240-50 Seminar in Historical Geography (3, 3) A

6260-70 Seminar in Cultural Geography (3, 3) A

6310-20 Seminar in Regional Geography of the United States (3, 3) A

6410-20 Seminar in Regional Geography of Latin America (3, 3) A

6710-20 Seminar in Physical Geography (3, 3) A

NOTE: Registration in 6000-level courses may be repeated with consent of department.

Geological Sciences

MAJOR

DEGREES

Geology

M.S., Ph.D.

Professors: K. R. Walker (Carden Professor and Head), Ph.D. Yale; H. J. Kleppner (Emeritus), Ph.D. Ohio State; O. C. Kopp, Ph.D. Columbia; R. E. McLaughlin (Emeritus), Ph.D. Tennessee, K. X. Misra, Ph.D. Western Ontario; G. M. Clark, Ph.D. Pennsylvania State; S. G. Driese, Ph.D. Wisconsin; N. B. Woodward, Ph.D. Lehigh; N. W. Bickle, Ph.D. Johns Hopkins.

The Department of Geological Sciences offers both the M.S. and Ph.D. degrees in geology. Persons interested in these programs should contact the department. For admission, an applicant must provide two rating forms or letters of recommendation, and GRE scores, including the subject exam in geology (or in another area if geology was not the area of previous undergraduate level concentration). Students are not admitted under provisional or non-degree status. A written and oral comprehensive exam is required. Graduation examination during the second term, maintenance of a minimum B average in all graduate coursework, and successful defense of the dissertation.

Course requirements include a minimum of 45 quarter hours of graduate credit that include no fewer than 24 hours in geology courses (21 or more if above 5000 level) and 9 hours of Thesis 5000. A public oral presentation of the thesis is required. Failure to achieve a 3.0 GPA for two successive quarters will terminate a student's candidacy.

THE DOCTORAL PROGRAM

Completion of the Ph.D. degree includes satisfactory performance on the comprehensive examination taken no later than the end of the second year, maintenance of a minimum B average in all graduate coursework, and successful defense of the dissertation.

Course requirements include a minimum of 39 quarter hours of graded courses for graduate credit and at least 36 hours of Dissertation 5000. At least 26 of the 39 hours must be at or above the 5000 level with a minimum of 9 hours in courses at the 6000 level. Up to one-third of required hours may be taken in related fields. Attendance in a weekly seminar is required each quarter for not more than 8 hours S/NC credit toward the degree total.

Each Ph.D. student must satisfy research tool requirement which will be determined by his/her faculty committee and which will consist of one of the following:

a. Demonstration by examination of a reading knowledge in one modern foreign language in which there is a significant body of geological literature.

b. Completion of course 3030 in an appropriate foreign language with a B or better.

c. Courses (minimum of 6 hours) at 3000 level or higher taken for undergraduate credit are completed with a B average in appropriate mathematics, statistics, or computer science courses. The course must be taken during a student's graduate program and must be approved by the student's entire committee.

Option c. is available only to students who have had previous formal college-level reading experience in an appropriate foreign language.

A written and oral comprehensive exam and an oral defense of the dissertation are required. Failure to pass the comprehensive exam (a second opportunity may be granted by the department) or to achieve a 3.0 GPA for two successive quarters will terminate a student's candidacy.

*1860 Mineralogy (4) Introduction to crystallography and study of minerals. Laboratory includes hand specimen, chemical and x-ray methods of identification. Prereq: 1010, Chemistry 1120 or equivalent. 3 hrs and 1 lab. A

*2310-20 Intervertebrate Paleontology (4, 4) Systematic review of intervertebrate fossil groups. 3210—Porifera to Annelida, including cnidarians, echinoderms, brachiopods, and conodonts. 2320—Mollusca through slower Chordata, including anthropods and echinoderms. May be taken separately or in sequence. Prereq: 3250; Biology 1210-20 or consent of instructor. 3 hrs and 1 lab or field period.
*3260 Paleobiology (4) Introduction to principles and methods of paleobiology. Exploration of each history. Prereq: 1020. 3 hrs and 1 lab or field period. A

*3310 Introductory Petrology (4) Introduction to classification and properties of igneous and metamorphic rocks. Prereq: 1020 and 3180 or equivalent. 3 hrs and1 lab or field period. A

*3330 Geology of East Tennessee (4) Lectures and field excursions. Prereq: 12 hrs of geology and consent of instructor.

*3360 Stratigraphy-Sedimentation (4) Introduction study of stratigraphic principles and practices and of sedimentary processes and interpretation of depositional environments. Prereq: 1020 and 3180. 3 hrs and 1 lab or field period. A

*3370 Structural Geology (4) Introductory discussion of structures such as folds, faults, joints, cleavage, and primary structures. Laboratory work includes depth and thickness problems, structure sections, structure contour maps. Prereq: 1020, Mathematics 1840-50 or equivalent. 3 hrs and 1 lab. A

4110 Principles of Economic Geology (4) Oriforming processes, classification of mineral deposits, survey of different types of mineral deposits with examples. Prereq: 3180, 3190, 3310 or equivalents. Recommended prereq: 4610. 3 hrs and 1 lab.

4115 Elementary Applied Geophysics (4) Basic geophysical techniques for gravity and magnetic surveying. Recommended: 1020, Physics 2220 or 3220. 3 hrs and 1 lab.

4130 Sedimentology (4) Introduction to physical processes in sedimentation, thin section analysis of sediments and formation of sedimentary structures, river flows, waves, tides, and ocean circulation. Prereq: 3310. 3 hrs and 1 lab.

4230 Paleocology (4) Principles of environmental analysis applied to fossil assemblages and associated lithologies. Prereq: 3260 or consent of instructor. 3 hrs and 1 lab.

4240 Paleobotany (4) Survey of fossil record of plants with particular emphasis on comparative morphological and evolutionary trends in major plant groups, and chronological succession and geographic distribution of past floras on earth. Prereq: 1020 or 2210; Botany 3010-20 or consent of instructor. (Same as Botany 4240). 3 hrs and 1 lab or field period.


4270 Micropaleontology (4) Survey of geologically, stratigraphically important microfossils and their biological associations. Discussion of fossil monerans, protists, and palynomorphs. Prereq: 3260 or consent of instructor.

4307 Introduction to X-Ray Methods (1) Generation and nature of x-rays as applied to x-ray diffraction, x-ray fluorescence and electron microprobe analysis. Prereq: 3180 or consent of instructor.

4310 Geologic Mapping (4) Interpretation of maps and methods of geologic mapping. Prereq: 12 hrs geology. 3 hrs and 1 lab or field period.

4320 Introductory Environmental Geology (4) Applications of geological sciences toward a comprehension of effects of geological processes on humans and effects of human activities on earth environments. Prereq: 4610. 1 lab or field period.

4330 Regional Geology of the United States (3) Evolution of various geologic provinces within U.S., integration of several types of geologic data. Prereq: Completion of core courses in major or equivalent.

4370 Tectonic Styles (4) Tectonic evolution of structures and environments in metamorphic, plateau motions, and stratigraphic assemblages as determined through case study examination of different orogeny belts. Prereq: 3370 or consent of instructor 3 hrs and 1 seminar or lab.

4440 Field Geology (3) Five-week field course, first term survival of the fittest. Advanced undergraduates or first-year graduates in geology. Employs entire time of students. Field techniques demonstrated, practiced and applied to solve practical problems. Prereq: 12 hrs geology and consent of instructor.

4460 Geologic Photography, Photogrammetry and Remote Sensing (4) Terrestrial, airborne, and satellite geologic remote sensing, photographic principles and practice, satellite imagery. Prereq: consent of instructor. 12 hrs geology and consent of instructor.

4510 Principles of Geomorphology (4) Gradational processes and recent earth’s surface and landforms produced. Prereq: 1010-20-30 or equivalent. (Same as Geography 4510). 3 hrs and 1 lab.

4550 Optical Mineralogy (4) Identification of minerals and determination of crystal-chemical parameters using petrographic microscope.

4610 Principles of Geochemistry (4) Application of chemical principles to geologic problems. Emphasis on crystal chemistry and relation between basic atomic structure and distribution and behavior of elements in the earth’s crust. Prereq: Chemistry 1110-20 or equivalent. Recommended prereq: 3310.

4650 Mineral Phase Equilibria (3) Principles of phase chemistry and application of phase equilibria studies in rock-forming mineral systems as aid to understanding conditions of formation and modification of rocks. Prereq: 4610 or consent of instructor.

4670 Exploration Methods (4) Principles of geologic, geophysical and geochemical exploration methods. Discussion of available commercial and research. Application to different types of mineral deposits.

4810 Special Problems in Geology (1-4) Prereq: Consent of instructor. May be repeated. Maximum 4 hrs.

5000 Thesis (1-15) P/NP only. E

5050 Geochemistry of Ore Mineral Deposits (3) Study of ore deposits based on experimental, empirical and theoretical geochemical considerations. Prereq: 4550 and 4110 or consent of instructor.

5069 Experimental Geochemistry Laboratory (1-3) Independent lab study of problem in geochemistry using lab techniques. Prereq: Consent of instructor.

5210 Special Problems in Geology (1-4) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

5290 Quaternary Problems (4) Interdisciplinary approach to interpretation of physical and biological phenomena directly or indirectly influenced by Pleistocene glaciation. Prereq: Elements of geology (3 quarters) or consent of instructor. (Same as Botany 5290 and Zoology 5290).

5310 Depositional Environments and Models for Exploration (4) Modern depositional environments and recognition of ancient analogs; facies applications to exploration and production geology.

5331 Quaternary Geology of North America (4) Development of quaternary landscapes as influenced by climatic change in conjunction with glacial, periglacial, fluvial, and eolian processes; regional characterization of quaternary stratigraphy, sedimentology, and geomorphology for North America. Prereq: 1410, equivalent, or consent of instructor.

5332 Quaternary Paleocology (4) Perturbation, processes and influence on quaternary ecosystems; climatic change and vegetational responses during last 2.5 million years. Prereq: Consent of instructor.

5333 Quaternary Field and Lab Techniques (4) Field methods for description and sampling of quaternary deposits and lacustrine sediments; identification of pollen and plant macrofossils; laboratory analyses of fossil plants and modern terrestrial sites in eastern North America. Prereq: 1410, equivalent or consent of instructor: 2 hrs and 2 labs.

5340 Seminar in Local Stratigraphy (1) Stratigraphy of Knoxville area.

5350 Selected Topics in Geology (1) Presentation of graduate research, topics from current literature, and special problems of students. Prereq: 4810 or consent of instructor. 2 hrs and 2 labs.

5370 Mesosfabric Analysis (4) Techniques of gathering, processing, and interpreting tectonic mesosfabric data. Prereq: 3370 or consent of instructor. 1 hr of period each quarter except summer for resident full-time graduate students. S/N/C only.

5460 Photogeologic Interpretation (4) Advanced photogrammetric techniques to obtain geological measurements from aerial photographs. Practice in photo interpretation of imagery connected with geological features. Prereq: Consent of instructor.

5470 Plate Tectonics and Orogeny (4) Geometry and kinematics of plate motion are used to devise models of geosystems, fold belts, metamorphic and plutonic belts, with recent and ancient examples. Prereq: 3370. 3 hrs and 1 seminar or lab.

5520 Igneous Petrology (4) Genesis and emplacement of igneous, and metamorphosed, and textural properties of resulting igneous rocks. Laboratory emphaizes petrographic description and classification of rocks in thin section. Prereq: 3310 and 4550. 2 hrs and 2 labs.

5530 Metamorphic Petrology (4) Physical and chemical characteristics of metamorphic environment, and effects on texture, chemical composition, and mineral equilibria. Laboratory emphasis petrographic description and interpretation of metamorphic rocks in thin section. Prereq: 3310 and 4550. 2 hrs and 2 labs.

5540 Terrigenous Clastic Sedimentary Petrology (4) Field and microscopic analysis of terrigenous clastic rocks. Perturbation and primary processes in affecting sediment texture and composition. Prereq: 3380 or equivalent. 3 hrs and 1 lab.

5550 Carbonate Sedimentology (4) Environments of deposition of modern and ancient carbonates. Prereq: 3310 or consent of instructor. Recommended: 4550. 3 hrs and 1 lab.

5570 Advanced Structural Geology (4) Brittle and ductile deformation features with orogenic belts in context of tectonic evolution. Course readings from recent literature and discussion of ongoing research. Prereq: 3370 or consent of instructor. 3 hrs and 1 lab or seminar.

5610 Analytical Techniques in Geology (1) Survey of sampling procedures and sample preparation, collection and treatment of data and application of modern analytical techniques to geological problems. S/N/C only.

5611 Atomic Absorption Analysis (1) Application of atomic absorption spectroscopy to chemical analysis of bulk geological samples: minerals, rocks, and ores. Prereq: 5610 or consent of instructor. 1 lab.

5612 Electron Microprobe Analysis (2) Theory and application of electron microprobe for chemical analysis of solid particles such as minerals. Prereq: 5610 or consent of instructor. 2 labs.

5616 X-Ray Diffraction Analysis (1) Application of x-ray diffraction procedures in identifying crystalline substances. Prereq: 5610 or consent of instructor. 1 lab.

5617 X-Ray Fluorescence Analysis (1) Application of x-ray fluorescence to chemical analysis of bulk geological samples, such as minerals, rocks, and ores. Prereq: 5610 or consent of instructor. 1 lab.

5635 X-Ray Diffraction: Single Crystal Techniques (3) Single crystal diffraction techniques, emphasis on precession and Weissenberg photography. Crystal symmetry and diffraction, reciprocal lattice and Ewald sphere constructions, space group determination and application to geological problems. Prereq: Knowledge of introductory crystallography and consent of instructor.

5640 Clay Mineralogy (4) Origin of clay minerals; structural and compositional properties; application of mineralogical techniques in clay mineral studies. Prereq: 3180 and 5630 or equivalent. 2 hrs and 2 labs. A

5660 Thermodynamics for Geologists (3) Principles
of chemical thermodynamics related to geologic processes. Prereq: Chemistry 1110-20 and calculus of a single variable or equivalents.

5655 Aqueous Geochemistry (4) Introduction to and applications of equilibrium thermodynamics to earth surface environments, including geochemistry of natural waters, weathering reactions, and Earth movement. Prereq: Chemistry 1110-20. Chemistry 1120 may be coreq. with consent of instructor. Recommended prereq: 5360. 3 hrs and 1 lab per week.

5680 Physical Geochemistry (4) Theory and practice of geochemistry as applied to geologic situations: phase equilibria, kinetics, geothermometers/thermometers, elemental partitioning geochemistry. Prereq: 3310. Recommended prereq: 4610. 3 hrs and 1 lab.

5690 Cathodoluminescence Petrography (2) Application to geological problems. Prereq: 3150 and 4550 or consent of instructor. 1 hr and 1 lab.

5710 Advanced Paleontology (4) Fossil invertebrates.

5720 Paleontological Nomenclature and Techniques (4) Codification of biologic nomenclature as it applies to geologic time. Prereq: Techniques in preparation and illustration of paleontologic materials and manuscript preparation for publication. 3 hrs and 1 lab.

5760 Biostratigraphy (3) Application of paleontologic data to stratigraphic study, codification of stratigraphic nomenclature and recommended practice. Prereq: 3260 and 3360. 1 hr and 2 hr seminar.

5820 Strata-bound and Stratiform Sulfide Deposits (4) Classification, distribution, characteristics and genesis of strata-bound and stratiform sulphide deposits. Mississippi Valley-type Pb-Zn deposits, strata-bound massive Cu-Zn-Pb deposits of volcanic and sedimentary associations, and stratiform Cu deposits. Prereq: 4110 or consent of instructor. 2 hrs and 2 lab/field/seminar periods.

5830 Magnatic Mineral Deposits (4) Classification, distribution, characteristics and genesis of mineral deposits related to magmatic processes. Magnetic segregation deposits of ultramafic-mafic association and porphyry Cu-Mo deposits. Prereq: 4110 or consent of instructor. 2 hrs and 2 lab/field/seminar periods.

5840 Ore Petrology (4) Ore mineral assemblages by reflected-light microscopy. Identification of ore minerals and interpretation of paragenesis from textures. Typical samples from different types of ore deposits, such as porphyry, 4110 and 4550, or consent of instructor. 2-2.5 hrs.

5850 Regional Studies in Geology (1-3) Literature study and seminars on specific regions of geologic interest, supplemented by field trip. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5860 Coal Depositional Environments (4) Coal stratigraphy and depositional environments. Carboniferous rocks of Appalachian region, problems in coal mining and coal quality. Prereq: 3360 or 4130.

5915 Regional Geomorphology (4) Selected geomorphologic-related areas, which have common elements such as history or development, related processes which have produced genetically similar assemblages of landforms. May be repeated with consent of department. (Same as Geography 5915.)

5920 Process Geomorphology (4) Gradational processes operating on or near earth's surface; application of analytical methods in lab and field. Prereq: 1430 and 4510. 3 hrs and 1 lab or field period.

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

**6110 Seminar in Strategoric Geology (3)**

**6210 Seminar in Paleontology (3)**

**6310 Seminar in Structural Geology (3)**

**6410 Seminar in Mineralogy (3)**

**6510 Seminar in Petrology (3)**

**6610 Seminar in Economic Geology (3)**

**6710 Seminar in Geochemistry (3)** Prereq: 4610 or consent of instructor.

**6810 Seminar in Geomorphology (3)** Prereq: 4510 or consent of instructor.

*Not available for graduate credit for geology majors.*

*Registration for 6000-level courses may be repeated with consent of department. Maximum 9 hrs per course.*

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**Germanic and Slavic Languages**

<table>
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<tr>
<th>MAJORS</th>
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<td>German Language and Literature</td>
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Emeritus Professors: H. W. Fuller, Ph.D. Wisconsin; R. L. Hii!er, Ph.D. Cornell.

Professors: H. Kratz (Head), Ph.D. Ohio State; J. E. Fagan, Ph.D. Pennsylvania; D. M. Fiano, Ph.D. Indiana; J. C. Osborne, Ph.D. Northwestern; M. P. Rice, Ph.D. Vanderbilt.

Associate Professors: N. A. Leuckner, Ph.D. Wisconsin; D. E. Lee, Ph.D. Stanford; G. J. Mellor, Ph.D. Chicago; U. Ritzenhoff, Ph.D. Connecticut.

Assistant Professors: C. Hodges, Ph.D. Chicago; J. J. Koledzij, M.A. Indiana.

The Department of Germanic and Slavic Languages offers two advanced degrees, the Master of Arts (M.A.) in German and the Doctor of Philosophy (Ph.D.) in German Language and Literature.

**THE MASTER'S PROGRAM**

The department requires a minimum of 45 quarter hours including 21 hours of coursework above 5000 level and 9 hours of Thesis 5000.

**THE DOCTORAL PROGRAM**

The candidate for the doctoral degree must complete a minimum of 81 quarter hours of course work beyond the Bachelor's degree in addition to 36 hours of doctoral research and dissertation. At least 45 quarter hours of the minimum must be taken in 5000 or 6000 courses. Of these 45 hours, a minimum of 18 hours must be chosen from the program seminar (5200) and the literary or philological seminars (6210-20-30-40-50-60 and 6310-20-30). At least 9 hours must be taken in a cognate field. Students are encouraged to take additional work in allied fields. A minimum of 18 hours of 5000 or 6000 courses. Students must show a fluent command of German, both oral and written, and a knowledge of two foreign languages. French and another language, such as Italian, Latin or Russian, appropriate to the field of research. A comprehensive examination, both written and oral, on German language and literature in an allied field or fields, must be passed before the student may be admitted to candidacy. The student will be examined on an extensive reading list which covers the whole range of German literature, and will be expected to show familiarity with major works of world literature. The candidate will be required to defend the dissertation in an oral examination, which will cover also the general area of the dissertation. Central emphasis is put on the doctoral dissertation as a final test of the candidate's scholarly qualifications.

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**German**

3010-20-30 Elements of German for Upper Division and Graduate Students (3, 3, 3) Elements of language, elementary and advanced readings. Open to graduate students preparing for language examinations, and upper division students desiring reading knowledge of the language. Undergraduate credit only. No credit for students having completed elementary German. E

4110-20-30 Studies in Classical and Modern Writers (3, 3, 3) Content varies. Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30, or courses in English translation) or equivalent. May be repeated with consent of department.

4140-50 Selected Topics in German Literature from 1750 to the Present (3, 3) Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30, or courses in English translation) or equivalent. May be repeated. Su

4150 Studies in German Authors (3) Life and works of a single outstanding German literary figure. Content varies. Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30, or courses in English translation). May be repeated. Su

4210-20-30 Studies in German Literary Types (3, 3, 3) 4210—Lyric poetry. 4220—Drama. 4230—Narrative prose. Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30) or equivalent.

4250 Introduction to Descriptive Linguistics (3) (Same as French, Russian, Spanish, and Linguistics 4250.) F

4260 Introduction to Historical and Comparative Linguistics (3) Linguistic change, protolanguages, phonological and morphological change. Cultural, historical, sociological influences upon the development of language. Semantic change. Lexicology. All these topics copiously illustrated by selected examples from Indo-European languages. Prereq: 9 hrs of upper division English, or 9 hrs of upper division courses in a modern or ancient language or equivalent of German and French 3010-20-30, courses in literature in translation, and general courses in Latin and Greek requiring no knowledge of these languages, or consent of department. (Same as French, Russian, Spanish, and Linguistics 4260.) W

4270 Introduction to Germanic Linguistics (3) Phonetics and phonemics of German. German grammar and vocabulary from descriptive point of view. Diaclects of German. Other Germanic languages.

4310-20 History of German Language (3, 3)

4650 German Civilization (3) Prereq: Intermediate German or equivalent.

4810-20-30 Advanced Conversation and Composition (3, 3, 3) Prereq: 3810-20-30 or equivalent or consent of department. F, W, Sp

5000 Thesis (1-15) P/NP only. E

5100 German Phonetics and Advanced Grammar (3) Advanced work in phonetics, pronunciation, and selected topics in German grammar. For teachers and prospective teachers. Prereq: Consent of instructor.

5101 Foreign Study (1-12) See page 104. E

5200 Prosennifer (3) Bibliography; methods; illustrative problems; preparation of papers. F
5210-20-30 College Teaching of German (1, 1, 1) Required of all M.A. or Ph.D. candidates, except those whose previous teaching experience warrants exemption from this requirement or who wish to pursue vocations other than teaching. F; W; Sp

5410-20-30 Medieval German Language and Literature (3, 3, 3) 5410—Introduction to Middle High German, 5420—Readings in Medieval German Literature. F; W; Sp

5500 Studies in German Literature (3) Content varies. May be repeated. Maximum 9 hrs. Su

5510 German Humanism and the Reformation (3)

5520 German Baroque Literature (3)

5530 The Enlightenment and the Rococo (3)

5540 German Classicism (3)

5560 German Romanticism (3)

5570 German Realism and Naturalism (3)

5580 Modern German Literature (1889-1945) (3)

5590 Modern German Literature (1945-Present) (3)

5600 German Literary Theory and Criticism (3) W

5610-30-40-50-60 Directed Readings in German Language and Literature (3, 3, 3, 3, 3) E

5710 Introduction to Old Norse (3) Phonology, morphology and syntax of Old Norse. Representative readings in Old Norse.

5720 Readings in Old Norse Prose (3) Intensive readings of Old Norse prose works. Icelandic saga as literary genre.

5730 Readings in Old Norse Poetry (3) Intensive reading of Eddic poems as a literary genre and repository of ancient Germanic customs, legends, and mythologies.

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6100 Gothic (3) Phonology, morphology, and syntax of Gothic language. Relationship to Indo-European languages and other Germanic languages. Readings from Gothic Bible.


6140 Old Saxon (3) Phonology, morphology, and syntax of Old Saxon. Representative readings.

6210-20-30 Seminar in German Literature (3, 3, 3) May be repeated. E

6310-20-30 Seminar in German and Germanic Philology (3, 3) May be repeated. E

**Russian**

3030 Elements of Russian for Graduate Students and Seniors (3, 3, 3) For graduate students preparing for a language examination and seniors desiring reading knowledge of a second foreign language. Prereq: 2 years of some foreign language in college or consent of department. Undergraduate credit only. No credit for students having completed 1 yr of Elementary Russian.

3220 Works of Leo Tolstoy in English Translation (3-4) War and Peace, Anna Karenina, and other works.

3221 Works of F.M. Dostoevsky in English Translation (3-4) Crime and Punishment, Brothers Karamazov and other works.

3240 The Russian Drama in English Translation (3-4) Selections from works of Fonvizin, Griboedov, Pushkin, Gogol, Ostrovsky, Turgenew, Chekhov, and others.

3250 The Works of Ivan Turgenew and Anton Chekhov in English Translation (3-4)

3260 Russian Folklore in English Translation (3-4)

4010 Selected Topics in Russian and East European Studies (3) Interdisciplinary seminar on selected topic using comparative approach.

4110-20-30 Studies in Major Russian Writers (3, 3, 3) Content varies. Pushkin, Lermontov, Gogol, Turgenew, Tolstoy, Chekhov, and others. Prereq: 9 hrs of 3000 course (exclusive of 3010-20-30, 3220-40-50-60) or equivalent. May be repeated.

4250 Introduction to Descriptive Linguistics (3) (Same as French, Spanish, Linguistics, and German 4250.) F

4260 Introduction to Historical and Comparative Linguistics (3) (Same as French, German, Spanish, and Linguistics 4260.) W

4271 Introduction to Slavic Literatures (3) (Same as Linguistics 4271.)

**Greek**

See Classics

**History**

**MAJOR**

**DEGREES**

History

M.A., Ph.D.

Professors:

J. Morrow (Head), Ph.D. Pennsylvania; P. H. Bergeron, Ph.D. Vanderbilt; E. V. Chmiel, Ph.D. California (Berkeley); L. P. Graf, (Emeritus) Ph.D. Harvard; A. G. Haas, Ph.D. Chicago; Y. P. Hao, Ph.D. Harvard; R. W. Haskins, Ph.D. Harvard; Ph.D. California (Berkeley), C. O. Jackson, Ph.D. Emory; M. Y. Klein, (Emeritus) Ph.D. Columbia.

Associate Professors:


Assistant Professors:


1) Distinguished Service Professor.

2) Alumni Distinguished Service Professor.

The Department of History offers graduate study leading to the Master of Arts and Doctor of Philosophy degrees. The M.A. program includes a thesis and non-thesis option and also offers a non-thesis concentration in historic preservation. The doctoral program has concentrations in American or European history. Detailed information may be obtained from the Director of Graduate Studies in History. All incoming students will be advised by the Director of Graduate Studies in History. The Department of History offers graduate study leading to the Master of Arts and Doctor of Philosophy degrees. The M.A. program includes a thesis and non-thesis option and also offers a non-thesis concentration in historic preservation. The doctoral program has concentrations in American or European history. Detailed information may be obtained from the Director of Graduate Studies in History. All incoming students will be advised by the Director of Graduate Studies in History.

**THE MASTER'S PROGRAM**

**Admission Requirements:**

1) Successful completion of a baccalaureate degree, preferably with a major in history; (2) Acceptable scores on the Graduate Record Examination (general and subject history); (3) A thesis is required. The M.A. program includes a thesis and non-thesis option and also offers a non-thesis concentration in historic preservation. The doctoral program has concentrations in American or European history. Detailed information may be obtained from the Director of Graduate Studies in History. All incoming students will be advised by the Director of Graduate Studies in History.

**Non-Thesis Option:** A total of 45 hours of coursework is required. A student must complete 5240, 5270, 6 hours of reading courses (5211-26) and 6 hours of 6000-level seminars. A two-hour written examination on one field and a two-hour oral examination on the other field is given at the end of the program. As many as 18 related hours may be taken in courses outside the department for either option.

**Concentration in Historic Preservation:** This option is a non-thesis program requiring 47 total hours, 26 hours outside the history department and 21 hours within. Required courses are 6 hours of 5215 or 5216 and 5226. Students will be examined in two fields: historic preservation and either American history to 1815 or American history since 1789.

**Retention and Termination:** A 3.0 overall GPA is required of graduate students to remain in good standing. The Graduate Awards and Review Committee monitors the progress of all graduate students each quarter.

**THE DOCTORAL PROGRAM**

**Admission Requirements:**

1) Acceptable scores on the Graduate Record Examination (general and subject history); (2) Successful completion of the M.A. degree.

**Residence and Course Work:** Students are required to offer a minimum of 75 credit hours in course work beyond the Bachelor's degree. No fewer than 45 hours must be in courses that are numbered above 5000. Only courses including one 6000 seminar. Students must take 5240 and 5270 or have taken their equivalent elsewhere. Candidates who have not written a Master's thesis must take two 6000 seminars. Students transferring from another institution may count up to 36 hours of coursework toward the required 75 hours. All students pursuing the Ph.D. degree must take a minimum 9 related hours outside the department. No fewer than 6 quarters of the 9 quarters of residence work (3 of which must be consecutive quarters) shall be under the supervision of the staff of UT.

**Language Requirements:** Candidates must possess a reading knowledge of one foreign language and such additional languages as may be determined by the student's committee. Under normal circumstances, those specializing in European history will need two languages. The committee may also specify any other research tools, such as statistics, essential for the student's preparation. Upon student petition, the committee may accept in place of a language a B or better performance in appropriate statistical courses and History 5290. The foreign language requirements may be satisfied in one of two ways:

(a) By examination. When the student is ready to take a language examination he/she should consult with an advisor. The appropriate form and the time of the examination may be obtained from The Graduate School.
(b) By course work. Upon consultation with the advisor, a student may elect to complete an appropriate 3010-20-30 sequence in a language department (or an intermediate sequence in a language in which no 3010-20-30 sequence is available.) Satisfactory completion requires that a stu-
dent must have at least a B in the final quarter.

Comprehensive Examination: The comprehensive examination which will be both written and oral must be taken after all course work is completed, language requirements fulfilled, and at least nine months before the degree is expected. This exam should normally be taken before beginning the ninth quarter of work toward the doctorate. The candidate must present four fields, distributed as follows: one major field (history); two minor fields (history); and one minor field (which may be either in history or outside the department). In any case, the student is required to have 9 hours of graduate work outside the History Department. Three of the four areas listed below must be represented by a major or a minor field, or both.

I. Ancient and Medieval
(1) Ancient Near East
(2) Greece
(3) Rome
(4) Early Middle Ages, 375-1000
(5) Late Middle Ages, 1095-1450

II. Early Modern
(1) Renaissance and Reformation
(2) Europe, 1559-1815
(3) American History to 1815
(4) Latin America 1492-1825

III. Modern
(1) Europe, 1815-1914
(2) European World Since 1914
(3) United States, 1815-present
(4) Latin America, 1789-present
(5) East Asia, 1841-present
(6) Middle East, 1798-present

IV. National, Sectional and Topical
(1) England, 1485-1675
(2) Great Britain, 1700-present
(3) France, 1559-1815
(4) France, 1559-1815
(5) Germany, 1555-1800
(6) Germany, 1806-present
(7) Russia, 1800-1900
(8) Russia, 1800-present
(9) Colonialism and Imperialism
(10) Diplomatic History of the States
(11) Social and Cultural History of the United States
(12) The South
(13) Frontier and Westward Movement
(14) Afro-American

Dissertation and Final Examination: Original research forms the basis for the dissertation. After the dissertation has been completed, a final oral examination will be given on the dissertation in its historical context.

3060-70 History of Western Religious Thought and Institutions (3, 3) (Same as Religious Studies 3400)
3140-50-60 History of England (3, 3, 3) 3140-To 1066. 3150-1066 through the Reform Bill of 1832. 3160-1832 to the present. Medieval state, church, and society; origins of Anglo-American law monarch and parliamentary government. Reform, seventeenth century revolutions, commercial, agrarian and industrial revolutions; class conflict, empire, welfare state, world wars, economic crisis.
3311-21 History of Tennessee (3, 3) 3311—Eighteenth Century to Civil War Era. 3321—1865 to present.
3411 The Renaissance (3) (Same as Religious Studies 3411)
3412 The Reformation (3) Reformation, Counter Reformation, and Wars of Religion. 1517-1618. (Same as Religious Studies 3412)
3431-32 Nineteenth-century Europe (3, 3) 3431—France and Russia revolutions and national revolutions, the milieu for conflicting economic, social and political ideas, culminating in massive revolutionary upheavals 1830-1914. Mautz and the Spanish revolution 1830-1850. Industrial and capitalist maturity in era of intense national rivalry; triumph of bourgeoisie, intellectual climate of realism, socialism, and materialism.
3445-46 History of France (4, 4) 3445—Emergence of Modern France (1715-1787). Social, intellectual and economic pressures in ancien regime; era of experimentation as a revolutionary and traditional France confront one another, 3446—Since 1871.
3470-80-90 History of Russia (3, 3, 3) 3470—To 1801. 3480—Nineteenth Century. 3490—Twentieth Century.
3710-20-30 History of Germany (3, 3, 3) 3710—Germany to 1700. First Reich's fortune and failure. Development of German imperial state from medi eval greatness to baroque age weakness, disastrous domestic religious struggles, rise of powerful princes, economic and cultural growth and decline. 3720—Germany 1700-1900: quest for nationhood. Austro-Prussian rivalry in times of Frederick the Great, Metternich, and Bismarck; effects of absolutism, En lightenment, romanticism, revolution, reaction, and industrial economics on German society and state. 3730—Germany since 1860. Catastrophic century. From empire, world wars and Third Reich to defeat and pacification, role of military, political impact of economic crises, Hitler and Nazism, and interplay of extremism, socialism and democracy.
3751 Ancient Near Eastern Civilization (3) Bronze and Iron Ages.
3760-70 The Ancient World (3, 3) 3760—Greece. 3770—Rome.
3780-90 History of the Middle East (3, 3) 3780—Rise and spread of Islam to the sixteenth century. 3790—The impact of the West on the Middle East from the sixteenth century to World War I.
3795 Contemporary Middle East (4) Background of current problems in the area, from World War I to present.
3800 North Africa Since 1630 (3) Morocco, Algeria, Tunisia, and Libya in the nineteenth and twentieth centuries.
3810-20 History of East Asia (3, 3) 3810—East Asia: history and culture to 1600. Introductory survey. Chiefly China and Japan; Korea and Vietnam also included. Confucianism, Buddhism, social structure, political tradition, Japanese feudalism. Comparison and contrast with Western history and culture. 3820—Modern East Asia since 1850. Introductory survey, China, Japan, Korea and Vietnam. Comparative modernization: Western impact, cultural transformation, communist movement, Japan's role in post-war economic success.
3870-80 History of Latin America (3, 3) 3870—Colonial and independence, 1500-1825. 3880—National Development, 1825 to present.
3911 The United States, 1877-1914 (3) Impact of industrialization, over-expansion, and social and Progressive reform programs upon American society.
3921 The United States 1914-1945. (4) American experience during World War I, Great Depression, New Deal, and World War II. Emphasizes domestic history but includes military and foreign policy.
3931 The United States 1945 to the Present (3) Demobilization and Cold War after World War II followed by wars in Korea and Vietnam; attempts to find labor peace, social and national prosperity for minorities. From Truman's administration to present.
4015 Studies in History (3-4) Variable content course affording opportunity to offer subject matter not covered in an existing course. May be repeated.
4040 History Behind the News (4) Contemporary analysis of historical background of selected news-worthy events in North and South America, Europe, and non-Western world. May satisfy history major requirements (except for Historical Research and Exposition). May be repeated by non-majors. Maximum 8 hrs.
4130 History of Colonialism and Imperialism (3) Nineteenth century to present.
4250-60-70 Euro-American Intellectual and Cultural History (3, 3, 3) 4250—From Reformation to the scientific revolution, 1500-1700. 4260—From the Enlightenment to the Age of the Revolutions, 1700-1870. 4270—From Subjectivism to Relativism, 1870-present.
4280 Women in European History (4) Comparative analysis of role and image of women in Medieval, Renaissance, and Victorian periods. Attention given to parallel changes in structure of family as well as relationships between culture and women's protest movements (Same as Women's Studies 4280).
4290 Women in American History (4) Approaches of 4280 applied to American Society (Same as Women's Studies 4290).
4292History and Philosophy of Afro-American Education (4) (Same as Cultural Studies and Curriculum & Instruction 4292).
4350 The American Experience in World War II (4) Team-taught. Diplomacy and warfare in Europe and Asia and impact of war on American society.
4370 U.S. Military History, 1754 to the Present (4) Examination of nation's broad strategic aims and means used to attain them, shifting strategy, tactics and weaponry involved in our wars, and relationship between American society and its armed forces.
4380 Civilian-Military Relationships in the Modern West (3) Civilian-military affairs from about 1900 to 1960 in Western Europe, Russia and America; emphasis in Western Europe: e.g., Dreyfus Affair, Army in Nazi Germany, and Truman-MacArthur controversy.
4470 Poland and its Neighbors (3) A survey of Polish history from its beginnings to present with some emphasis on the Polish question with context of modern international affairs.
4480 Russian Intellectual History (3) From eighteenth century to present, emphasizing problems of Westernization, nationalism, and revolutionary tradition.
4490 Soviet Foreign Policy (3)
4500 History of Medieval England (3) From Anglo-Saxons to coming of Tudors; relationship between legal and constitutional developments and structure of society.
4510-20 Tudor-Stuart England (3, 3) 4510—Renaissance and Reformation in England; Thomas More, Elizabeth I, and Mary, Queen of Scots. 4520—Puritans, English Civil War, Glorious Revolution and Scientific Revolution; Stuart kings, Oliver Cromwell, Milton, Hobbes, and Locke.
4551 British Society and the Industrial Revolution, 1760-1848 (3) Emergence of modern industrial society: urbanization, mechanized factory production, social engineering via schools and police, mass politics and reform, class conflict, economic and population growth.

4570 Twentieth Century Britain (3) Emergence of welfare state, political impact of Labour movement, World War and Depression, chronic economic crisis, persistence of class conflict.

4610-20-30 The American Frontier and Westward Movement I, II, III (3, 3, 3) Settlement and development of the "West" throughout American history. 4610 From the Atlantic to the Mississippi. 4620-30—The Trans-Mississippi West.

4641-51 America: Mind, Mood and Society (3, 3) Social and cultural history and thought from mythological and religious origins to major beliefs and values which formed the foundation of present-day life in the United States. 4641 Colonial period to 1865. 4651—1885 to present.

4661 Studies in American Social and Cultural History and Thought (3) Intensive examination of specific themes, problems, or ideas.

4670 Cities and Urbanization in American History (4) Origins, growth and influence of American cities in development of the nation, from colonial era to present.

4680 History of Knoxville (3) Knoxville, Tennessee, as a case study of the social changes and transformations which took place in the area and their impact on the development of the city and the region.


4741 Italian City-States, 1250-1500 (3) Evolution of urban civilization in northern and central Italy in medieval and Renaissance periods. Architectural and townscape forms studied in socioeconomic as well as cultural contexts. Florence is primary focus, but other major city-states also included.

4770 Austria to 1850: Habsburgs and the Heartland (3) German and Catholic Austria's growth from frontier to great center of civilization, its imperial mission, relation to Roman Empire, and neighbors and assertive nationalities: Maria Theresa, Metternich, unity and diversity, and Vienna's cultural contributions.


4800 History of Mexico (3)

4820 History of Mexico, 300-1519 (3) Pre-Columbian Mexico: history of the Aztecs and their predecessors. 4830 History of Mexico, 1519-1821 (3) Conquest by the Spanish and the early colonial period.

4840 History of Mexico (3)

4850 History of the Caribbean (3) Caribbean region from discovery and colonization to contemporary times.

4870-80-90 China (3, 3, 3) 4870—Chinese high culture from Confucius to Mao Tse-tung. Traditional religion, philosophy, fine arts, literature, cultural legacy under communism; similarities and differences between Chinese and Western cultures. 4880—To 1600. Uniqueness of Chinese experience, its influence on Japan and Korea, relevance in today's world. 4890—Modern China from 1850. Chinese Revolution in context: Imperialism, reform, nationalism, communist movement. Mao Tse-tung: China in today's world. No previous knowledge of China required.


4950 The Afro-American Experience to 1865 (3) Acculturation of blacks in early America, legal, social, and cultural implications of slavery before Civil War, and related plight of free blacks in context of slave trade, American Revolution, westward migration, and genesis of sectionalism. (Same as Afro-American Studies 4950.)

4960 The Afro-American Experience Since 1865 (3) Black attempts to realize freedom and equality pressures for the realization of these goals: the inequalities they faced, and the impact of World War II on the black experience. (Same as Afro-American Studies 4950.)

5000 Thesis (1-15) P/NC only. E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5015 Periods in European History (3) May be repeated. Maximum 9 hrs.

5016 Periods in American History (3) May be repeated. Maximum 9 hrs.

5101 Foreign Study (1-12) See pages 104.

5102 Off-campus Study (1-12) See page 104.

5103 Independent Study (1-12) See page 104.

5211-5226 M.A. Reading Course (3 hrs each) Directed readings in preparation for fields required for Master's oral examination. 5211, Ancient; 5212, Medieval; 5213, Early Modern Europe; 5214, European History Since 1788; 5215, American History to 1815; 5216, American History since 1876; 5217, Latin America; 5218, Far East; 5219, Colonialism and Imperialism; 5221, England; 5222, Russia; 5223, Germany; 5224, France; 5225, Middle East; 5226, Historica Preservation. Open only to Master's candidates in history. S/NC only. E

5240 Introduction to Historical Research (4) Principles and techniques of research in study of history: traditional and newer methodologies. Required of all candidates for advanced degrees except historic preservation.

5260 American Historiography (3) Introduction to historical literature of American history.

5270 Schools of Western Historical Thought (4) Principal schools of western historical thought and the philosophic assumptions. Required of all candidates for advanced degrees except historic preservation.

5290 Quantitative Analysis of Historical Data (3) Prereq: Sociology 3530 and 3535, or consent of instructor. Sp.

5300 Topics in History (3)

5310 Topics in Women's History (3)

5320 Topics in Historical Editing (3) Principles and practice of editing documents.

5360 Topics in American Foreign Relations (3)

5410 Topics in Early Modern European History (3)

5445 Topics in Nineteenth-century European History (3)

5450 Topics in Twentieth-century European History (3)

5480 Topics in Russian History (3)

5510 Topics in Tudor-Stuart England (3)

5520 Topics in Modern English History (3)

5550 Reaction and Reform in England, 1789-1848 (3)

5640 Topics in American Social and Cultural History (3)

5645 Topics in American Urban History (3)

5650 Topics in the American Westward Movement (3)

5660 Topics in Afro-American History (3) May be repeated. Maximum 9 hrs. (Same as Religious Studies 5660.)

5670 Topics in American Colonial History (3)

5675 Topics in the Early National Period of American History (3)

5680 Topics in Nineteenth-century American History (3)

5690 Topics in Twentieth-century American History (3)

5720 Topics in Medieval History (3)

5750 Topics in Ancient History (3)

5780 Topics in German National Socialism (3)

5790 Topics in Middle Eastern History (3)

5820 Topics in Mexican History (3)

5850 Topics in Chinese History (3)

5860 Topics in Japanese History (3)

5910 Topics in Southern History (3) May be repeated. Maximum 9 hrs.

5940 Local and Regional History (3) Concept and applicability of regionalism, analysis and study of United States regional models. May not receive credit for both 4940 and 5940.

5950 Material Culture (3) Use of cultural artifacts—public, residential, and commercial buildings, photographs, film, clothing, furnishings—to gain insight into American past. Primary emphasis on 19th and 20th centuries.

5960 Historical Agencies (3) Management and organization: philosophy and purpose, problems of accounting and fund raising, routing operation and publications.

5990 Historic Preservation Internship (3) Practical experience with regional historical agency, project or site. Students expected to do internships near completion of graduate program, and to submit scholarly written analysis of relationship between academic program and applied project to both project supervisor and departmental advisor.

6000 Doctoral Research and Dissertation (3-15) Pr/NC only. E

6210-20-30-40 Directed Readings (3, 3, 3, 3) Individual readings directed toward preparation for preliminary examination fields. Open only to candidates for Ph.D. degree who are in residence and who have been in residence at least two quarters. Only one course may be taken in preparation for each of four fields. Depending on field which he/she is reading, student will be assigned to appropriate member of department. S/NC only. E

6300 Seminar in Special Studies (3)

6310 Seminar in Tennessee History (3)

6350 Seminar in American Diplomatic History (3)

6410 Seminar in Western Europe (3)

6444 Seminar in French History (3)

6480 Seminar in Russian History (3)

6510 Seminar in English History (3)

6610 Seminar in American Colonial History (3)

6620 Seminar in the Era of the American Revolution (3)

6630 Seminar in Early National Period of American History (3)

6635 Seminar in Jacksonian Period (3)

6640 Seminar in Social and Cultural History of the United States (3)

6650 Seminar in the American Westward Movement (3)
Human Services

4300 Working Within the System (6) Survey of content within which need for human services arises, and analysis of process by means of which such services are provided. Prereq: Consent of instructor.

Latin

See Classics

Mathematics

MAJOR DEGREES

Mathematics M.M., M.S., Ph.D.

Professors:
G. E. Alber (Emeritus), Ph.D. Wisconsin; J. S. Bradley (Head), Ph.D. Iowa; J. H. Carruth, Ph.D. Missouri; D. B. Doob, Ph.D. Cornell; C. E. Clark, Ph.D. Louisiana State; R. E. Cline, Ph.D. Purdue; R. J. Daverman, Ph.D. Wisconsin; D. J. Dessart, Ph.D. Maryland; D. D. Dobrowski, Ph.D. Cornell; E. D. Evans (Emeritus), Ph.D. Texas; H. Frandsen, Ph.D. Illinois; D. A. Gardner; Ph.D. North Carolina State; R. T. Gregory (Emeritus), Ph.D. Illinois; T. G. Hallam, Ph.D. Missouri; D. B. Hinton, Ph.D. Illinois; T. Terwilliger (Emeritus), Ph.D. Chicago; L. S. Husch, Ph.D. Florida State; G. S. Jordan, Ph.D. Pennsylvania State; H. M. McCone, Ph.D. Duke; H. T. Mathews, Ph.D. Tulane; D. D. Miller (Emeritus), Ph.D. Michigan; B. R. Rajput, Ph.D. Illinois; K. C. Reddy*, Ph.D. Indian Institute of Technology (India); W. P. Schaefer, Ph.D. Maryland; S. Serbar, Ph.D. Cornell; F. W. Stallmann, Ph.D. Giessen (Germany); E. Wachpress, Ph.D. Rensselaer Polytechnic Institute; W. R. Wade, Ph.D. California (Riverside); C. G. Wagner, Ph.D. Duke; J. J. Walsh, Ph.D. SUNY (Binghamton).

Associate Professors:
V. Alexopoulos, Ph.D. Delaware; H. Atlakos, Ph.D. Brown; D. F. Anderson, Ph.D. Chicago; V. A. Douglas, Ph.D. Harvard; J. Dydek, Ph.D. Wisconsin; K. R. Kimble*, Ph.D. Ohio State; Y. Kuo, Ph.D. Cincinnati; B. A. Kupersmidt*, Ph.D. Massachusetts Institute of Technology; H. L. Lee (Emeritus), Ph.D. Duke; W. E. Luther, Jr., Ph.D. Wisconsin; R. Rowlett, Ph.D. Virginia; H. Simpson, Ph.D. California Institute of Technology; J. Smith, Ph.D. California (Berkeley); K. Soni, Ph.D. Oregon State; R. P. Soni, Ph.D. Oregon State; R. P. Stephenson, Ph.D. Wisconsin; C. Sundberg, Ph.D. Wisconsin.

Assistant Professors:

*Space Institute, Tiahomia.

The Mathematics Department has three graduate degrees: (1) the Master of Mathematics degree, intended primarily for teachers of high school mathematics, (2) the Master of Science degree, designed to prepare students for industrial employment and for college and university teaching and research. Contact the department office for additional information.

MACHINE OF MATHEMATICS PROGRAM

Before admission, the applicant must have either (a) certification for teaching secondary mathematics in at least one of the states of the United States, or (b) three years of successful elementary or secondary school teaching experience. Evidence of the requirement being met must be supplied by the student.

Applicants for admission to the program must take the Graduate Record Examination (aptitude portion), and have had at least one year of college mathematics including analytic geometry.

The following requirements must be met:
1. Computing: 45 hours of work in mathematics courses numbered above 4000. Of the additional 9 hours, may be in an area outside the department and 21 must be in courses in mathematics numbered above 5000.

After two quarters of study, a student whose supervisory committee gives its approval may choose the non-thesis option. For a given student and an area, the Graduate Committee and the Applied Mathematics Committee.

THE MASTER OF SCIENCE PROGRAM

The department offers two options for this degree. The first option requires a thesis for which 9 hours must be earned along with 36 additional hours of work in acceptable courses numbered above 4000. Of the additional 9 hours, may be in an area outside the department and 21 must be in courses in mathematics numbered above 5000.

A student intending to work in mathematical ecology, may complete either the mathematical ecology option. A student intending to work in mathematical ecology option. A student intending to work in mathematical ecology may complete either the mathematical ecology option. A student intending to work in mathematical ecology may complete either the mathematical ecology option. A student intending to work in mathematical ecology may complete either the mathematical ecology option. A student intending to work in mathematical ecology may complete either the mathematical ecology option. A student intending to work in mathematical ecology may complete either the mathematical ecology option. A student intending to work in mathematical ecology may complete either the mathematical ecology option. A student intending to work in mathematical ecology may complete either the mathematical ecology option.

A. Standard option: Pass Written examinations covering four subjects, at least three of which must be from the following list:
1. Algebra 5510-20-30
2. Functions of a Complex Variable 5110-20-30
3. Topology 5910-20-30
4. Functions of a Real Variable 5210-20-30

b. Linear Analysis 5240-50-60
f. Partial Differential Equations 5450-60-70
g. Ordinary Differential Equations 5870-80-90

i. Mathematical Statistics 5565-65-75
j. Numerical Mathematics 5570-60-70

Students may not take examinations in both d. and e. nor may they take examinations in both f. and g. as their comprehensive examination subjects. Those students who choose four from this list must choose two from a. through e. and the students who choose only three from this list must choose one from a. through e. The student may take all the examinations in one subject at any time these exams are given subject to the following conditions:
1. The exams to be taken must be approved in advance by the student's supervisory committee.
2. At most 4-n exams may be taken at any one time, where n denotes the number of exams previously passed by the student.
3. A student may take a collection of written examinations a maximum of four times, but no one failing five exams, counting possible repetitions, will be permitted to take another round of exams.
4. Mathematical ecology option
1. Pass written examinations covering three subjects in mathematics: one must be mathematical ecology and two must be from the list under the standard option.

Students may not take examinations in both d. and e., nor may they take examinations in both f. and g. At least one exam must be chosen from a. through e. The student may take as many written examinations as desired at any time these exams are given subject to the following conditions:
1. The exams to be taken must be approved in advance by the student's supervisory committee.
2. At most 3-n exams may be taken at any one time, where n denotes the number of exams previously passed by the student.
3. A student may take a collection of written examinations a maximum of three times, but no one failing four exams, counting possible repetitions, will be permitted to take another round of exams.
4. Pass a written examination in ecology, covering material selected from nine hours of coursework outside of mathematics at the 5000 level or above.
The course submitted for examination must be approved by the supervisory committee and the departmental Graduate Committee. The exam is to be prepared, administered, and graded by instructors of the course involved, along with at least one member of the Mathematical Ecology section. The student must obtain written agreement to participate in the examination from instructors of these courses and from at least one member of the students in secondary mathematics, before submitting materials to the committees for approval.

b. A student may take the written examination twice.

d. Demonstrate proficiency in one foreign language, normally from among French, German, or Russian; this requirement is to be met prior to the examination in the area of specialization. The doctoral committee may require that the student pass a second language exam.

III. Pass an intensive exam in the field of specialization. This exam will be given by a committee appointed by the department head at some time after the requirements in I. have been met. A student may take this specialty exam only twice.

IV. Take a one-year, 6000-level sequence in mathematics in the other area of concentration. The use of the course selected to fulfill this requirement must be approved by the department head and the student’s doctoral committee. (Such approval may occur after completion of the course.)

Note: Math 3050, 3060, 3090, 3100, 3110, 3310, 3320, 3330, 3510, and 3720, are intended primarily for students preparing to teach in elementary or secondary schools.

Any 3000 or 4000 course in the department whose course number ends in "zero" may be offered as an honors version. In this case, the last digit will appear as an "H" and the title will be preceded by the word "Honors" both in the timetable and on the student’s transcript. Honors versions of courses listed in the Graduate Catalog are accepted for honors credit. Such courses may be offered upon the initiative of interested faculty, students, or the department head (though in all cases subject to the approval of the department head).

3050 Elementary Probability and Statistical Analysis (3) Combinatorial problems; sample spaces, sets, and events; statistical independence; axiomatic probability theory; random variables and their distributions; simulation and random processes. Does not satisfy requirements of major or minor in mathematics. Prereq: 1550-60 or equivalent. W, Sp

3060 Elementary Statistical Analysis (3) Elementary probability distribution used in statistics: binomial, Poisson, and normal and their properties; sampling theory; confidence intervals and statistical tests of hypotheses; least squares and linear regression. Does not satisfy requirements of major or minor in mathematics. Prereq: 3050 or consent of instructor. Sp, Su

3090 Polynomials and Rings (3) An introduction to abstract algebra, beginning with study of integers followed by more general notion of rings, integral domains, and fields. Emphasis is given to certain ring theoretic properties shared by integers and polynomials over various fields. Prereq or coreq: 3100 or consent of instructor.

3100 Logic and Sets (3) Elements of mathematical logic; elementary algebra of sets. Primarily for students in the College of Education. Does not satisfy requirements of mathematics outside of mathematics. Prereq: 1 yr college mathematics. Su

3110 Real Number System (3) Laws of arithmetic; rational, irrational, and real numbers; least upper bound property; countability; 1 yr of college mathematics. Primary for students in the College of Education. Does not satisfy requirements of major or minor in mathematics. Su

3150 Introduction to Numerical Algorithms and Programming (3) (Same as Computer Science 3150 E) Topics covered include numerical analysis, numerical problem, vector and matrix norms. Jordan canonical form, evolution of discrete and continuous systems, quadratic forms, and error, iteration topics. Must be taken in sequence. Prereq: 2860.

3155 Introduction to Numerical Algorithms (3) (Same as Computer Science 3155 E) Discrete Structures II (3) (Same as Computer Science 3215.)

3220 History of Mathematics (3) Survey of development of various branches of mathematics, from ancient to modern times. Prereq: 1860 or 2550 or equivalent.

3310 Advanced Euclidean Geometry (3) Triangles and circles, constructions, modern concepts. Prereq: 1 yr of college mathematics. F

3320 Non-Euclidean Geometry (3) Foundations of geometry. Elliptic and hyperbolic plane geometry. Prereq: 1 yr of college mathematics. W

3330 Transformational Geometry (3) Fundamental transformations in Euclidean geometry. Classification of isometries and similarities; symmetries of a polygon; inversions. Prereq: 1 yr of college mathematics. Sp

3510 Intermediate Analysis for Teachers (3) Primarily for students considering mathematics education. Course covers elementary calculus from advanced viewpoint with emphasis on proofs of basic theorems. Topics covered include limits, continuity, uniform continuity, differentiation and Riemann integration. Must be taken in sequence. Prereq: 2840-50-60. W


3780-90 Introduction to Combinatorial Theory (3, 3) Introduction to problems of arrangement and selection within discrete systems. Enumeration by recurrence relations and generating functions, graph theory, finite geometries and finite fields, partitions, block designs. Some applications. Prereq: 2860 or consent of instructor. F, W, Sp

3810 How To Prove It (3) Course is designed to improve students' writing skills by helping them learn how to write clear and persuasive mathematical arguments. Prereq: 2860 and 1550.

3861 Mathematical Models in the Life Sciences (3) Mathematical modeling techniques applied to biological phenomena. Does not satisfy requirements of major or minor in mathematics. Prereq: 1841-51 or consent of instructor.

3870-80 Introduction to Continuous Mathematics (3, 3) Topics include linear algebra, vector spaces, linear transformations, eigenvalues and eigenvectors, similarity and unitary transformations, singular value decomposition, and least squares. Must be taken in sequence. Prereq: 3510 and 3550 or equivalent. W

4050-60-70 Matrix Algebra and Applications (3, 3) Introduction to matrices and vector spaces. Linear transformations and their matrices, systems of linear equations and determinants, new products, and diagonalization of symmetric matrices. Prereq: 2860 or 4050. F

4120 Linear Algebra (3) Abstract vector spaces, linear transformations, and their matrices, systems of linear equations and determinants, inner products, and diagonalization of symmetric matrices. Prereq: 2860 or 4050. F

4150-50 Abstract Algebra (3, 3) Equivalence relations and partitions, properties of integers, elementary theory of groups and rings, integral domains, fields, unique factorization domains, vector spaces, linear algebra, and linear transformations, systems of linear equations and determinants, inner products, and diagonalization of symmetric matrices. Prereq: 2860 or 4050. F

4225 Numerical Solution to Equations and Numerical Approximations (3, 3) Interpolation by polynomial, piecewise polynomials, quintic, and spline functions. Does not satisfy requirements of major or minor in mathematics. Prereq: 3150 or 3155. (Same as Computer Science 4225.) F, W

4235 Numerical Methods for Ordinary Differential Equations (3) Introduction to numerical methods for first-, second-, and general-order differential equations. Stability, consistency and convergence. Current algorithms, variable step and order; stiff systems. Boundary value problems. Prereq: 3150 or 3155 and 4610 or 4225. (Same as Computer Science 4710.) W, F


4250-60-70 Introduction to Complex Analysis (3, 3) 4250-60 Topics include complex numbers, Cauchy’s theorem, Cauchy integral equations, Taylor’s series, and Laurent’s series. Prereq: 3150 or 4050. W


4510-20-30 Introduction to Analysis (3, 3, 3) Prereq: 3150 or 4050. Real numbers, elementary properties of real numbers, uniform continuity, differentiation, integration. Functions of several variables implicit function theory. Multiple integrals, partial derivatives, line integrals, divergence, Green’s theorem, surface integrals, uniform convergence, Taylor series. Should be taken in sequence. Note: Credit will not be given for both 4530 and 5100.

4420 Infinite Series and Functions of Several Variables (3) General theory, power series and Taylor’s formula, uniform convergence. Partial differentiation and maxima and minima for functions of several variables. LaGrange multipliers. Prereq: 2860.

4520 Partial Differential Equations (3) Fourier series; orthogonal functions; the vibrating string; solution by series; heat flow. Bessel func- tions. Prereq: 2860. Recommended: 4610 or 4710. E

4610-20-30 Differential Equations (3, 3, 3) Linear first and second order equations. Power series
solutions and Legendre polynomials. Regular singular points and regular nonlinear equations. Systems of linear differential equations and the matrix exponential, 4620-30—Sturm-Liouville boundary value problems, regular singular points, Frobenius method, and Bessel equations. Syste-

4640 Calculus of Finite Differences (3) Real difference equations; application to problems in engineering and physics. Prereq or coreq: 4510.


4710 Vector Analysis (3) Fundamental operations, basis vectors, dot and cross products. Differential derivatives, divergence and curl of vector fields, and surface integral divergence theorem of Gauss, and Stokes' theorem. Note: Credit will not be given for both 4530 and 4710.

4750-60-70 Introductory Probability Theory (3, 3, 3) Elementary combinatorial analysis, probability in discrete sample spaces, conditional probability and stochastic independence, binomial, Poisson, hyper-


4810 Elementary Number Theory (3) Divisibility; con-
gruences; theorems of Fermat and Wilson, primitive roots; indices, quadratic reciprocity. Prereq: 2860 or consent of instructor. Su.

4890 Readings in Mathematics (1-3) Open to superi-
or students with consent of department head. Independent study with faculty guidance. May be repeat-
ed. Maximum 9 hrs.

4990 Studies in Mathematics (1-4) Credit determined at registration. Prereq: Recommendation of Mathemat-
ics Department faculty member and consent of department. May be repeated. Maximum 9 hrs.

5000 Thesis (1-15) P/NP only. E.

5002 Non-Thesis Graduate Completion (1-3) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. No more than 3 credits towards degree require-
ment. Prereq: May be repeated. S/N only. E.

**5011 Elementary Functions from an Advanced Standpoint for Teachers (3-4) Order and complete-
ness axioms of real numbers: limits of sequences, derived functions; definitions and derivatives of exponential, logarithmic and trigonometric func-
tions; infinite series, convergence, Taylor's and Maclaurin's series; applications to construction of logarithmic and trigonometric tables. Prereq: 3510 or 3110 or consent of instructor.

**5012 Differential Geometry for Teachers (3-4) Advanced techniques applied to graphing functions. Curves; surface parametrizations, singular points, tangent lines and tangent planes, osculating planes, arc length of curves in plane and curves on surface, curvature, torsion, asymptotes, local coordinates, Frenet formulas. Prereq: 1 yr of calculus, or consent of instruc-
tor.

**5013 Geometry for Teachers (3-4) Primarily for high school teachers of geometry. Historical and modern presentations of topics encountered in a high school

**This course is intended for students in the Master of Mathematics program and for students in graduate pro-
grams in education. It may not be applied as graduate credit toward the M.S. degree in Mathematics.

geometry class: axioms, synthetic and metric; models; betweenness; congruence of segments and trian-
gle; parallel postulate, similarity, area; ruler and compass constructions; Klein's Erlangen Program. Prereq: Consent of instructor.

**5014 Analysis for Teachers (3-4) Functions of sever-
ral variables; continuity, partial derivatives, directional derivatives and gradient, implicit:

function theory, maxima and minima, transformations. Prereq: 3510 or consent of instruc-
tor.

**5015 Probability and Statistical Inference for Teachers (3-4) Probability distributions including bino-

cial, hypergeometric, and Poisson; moment generating functions, random variables, expectations, and varia-
tes; moment generating functions of uniform and normal distributions. Sampling including Chi-square, F, and t distributions; interval estimation of means and variances; simple hypothesis testing. Prereq: 1 yr of calculus and 3050 or consent of instructor.

5051 Introductory Business Mathematics (3) Graphing of simple equations, straight lines, circle, parabola, functions, algebra of functions, limits, continuity, deriv-
atives of algebra functions, applications to maxima and minima, optimization and concavity, implicit differen-
tiation, chain rule, higher derivatives, and applications. Credit available only to satisfy MBA core require-
ment. Prereq: Math 1550 or equivalent.

5052 Mathematics for Business Decisions (3) Exponential and logarithmic functions, growth and decay models, antiderivatives, integration as area, funda-
mental theorem of calculus, method of substitution, integral tables, and Simpson's rule. Improper integrals, applications, functions of two var-
iables, partial derivatives, integration over simple regions, applications to introductory matrix algebra, theorems, application to solution of simultaneous equations. Credit available only to satisfy MBA core requirement. Prereq: Math 5051 or equivalent.

5110-20-30 Theory of Functions of a Complex Vari-
able (3, 3, 3) Complex numbers; infinite series; analytic functions; conformal mapping; analytic continuation; special functions; Riemann surfaces. Prereq: 4510-20 for 5110; 4530 for 5120. Must be taken in sequence. F, W, Sp.

rem of Calculus. 5220—Banach spaces, Riesz representation theorems, Hahn-Banach, open mapping, closed graph theorem, Banach's fixed point theorem, 5230—Absolutely continuous functions and func-


5370-80-90 Mathematical Principles of Fluid Mechan-
ics (3, 3, 3) Equations of motion, incompressible flows, flows of compressible perfect gases, shock waves in gases; conformal mapping; analytic continuation; and by successive approximation; methods of reduc-
tion to normal form; successive approximations to roots of matrices; measures of error. Prereq: Consent of instructor.


5475 Advanced Topics in Numerical Partial Differen-
tial Equations (3) Finite element methods for eigenvalue problems, IV problems, BV problems with singulari-
ties. Other topics, such as special methods, further study of finite difference methods, etc. at discretion of instructor. Prereq: 5455-65. (Same as Computer Science 5475.) Sp.

5490-90 Mathematical Programming (3, 3) Optimization of functions or variables subject to constraints. Prereq: 3150, 4060 and 4530. W, Sp.


5550-70-80 Theory of Matrices in Numerical Anal-
ysis (3, 3, 3) Matrix identities and inequalities: Factorization theorems, generalized recip-
orals. Hadamard inequalities, Lanczos reductions. 5570—Vector and matrix norms, convergence, domains of inclusion and exclusion of roots of matrices; the field of values; minimax and maximum theorems for Hermitian matrices; Kantorovic inequalities. 5580—Computational methods for inverting matrices, direct and by successive approximation; methods of reduc-
tion to normal form; successive approximations to roots of matrices; measures of error. Prereq: Consent of instructor.


5655-65-75 Numerical Mathematics (3, 3, 3) Analysis of direct and iterative methods for solution of linear algebraic equations; linear least squares prob-
75,) F, W, Sp.

5750-60-70 Advanced Mathematical Statistics (3, 3, 3) Distribution functions and mathematical expecta-

5810-20-30 Number Theory (3, 3) Arithmetic func-
tions, distribution of primes, Diophantine equations, approximation theory, Shnirelman density and Mann's theorem, quadratic forms, Dirichlet's theorem, prime number theorem. Prereq or coreq: 5510 for 5810; 5520 for 5820.

5840-50-60 Mathematical Ecology (3, 3, 3) Discrete and continuous models in ecology. Population, com-
munity, and ecosystem models from qualitative modeling perspective. Physical environment modeling effects in ecosystems. Specific ecosystem models; predator-prey competition, parasite-host, foraging, and food webs. Stochastic growth models, random model effects. Comparison of stochastic with deterministic models. Prereq for 50 level: consent of instructor; prereq for 40 level: consent of instructor or 4610 or consent of instructor. F, W, Sp, A.

5870-80-90 Introduction to Ordinary Differential
Equations (3, 3, 3) Existence, uniqueness, extendability, continuity of solutions, power series, Frobenius methods for regular singular equations; Poincare-Bendixson theory, stability of critical points; boundary value problems for linear systems; regular and singular perturbation theory for nonlinear systems. Prereq: 4610, 4505, 4510-20-30. F, W, Sp, A

6510-20-30 Advanced Ordinary Differential Equations (3, 3, 3) Theory of ordinary differential equations from advanced viewpoint. Topics from current literature: Subject matter varies according to interests and preparations of students. Prereq or coreq: 5110-20-30, 5210-20-30 or 5210-20-30 or consent of instructor.


6810-20-30 Topological Algebra (3, 3, 3) Topics chosen from topological semigroups, topological groups. Lie groups; transformation groups; topological lattices; relations in topological spaces; topological rings, fields, algebras. Prereq or coreq: 5910-20-30.

6910-20-30 Modern Topology (3, 3, 3) Technical background to current literature in topology. Topics vary from year to year.

6940-50-60 Introduction to Algebraic Topology (3, 3, 3) Homology, cohomology, and homotopy theories. Homology and cohomology groups, the Eilenberg-Steenrod axioms, cup and cap products, duality theorems, homotopy equivalence, higher homotopy groups, fiber spaces, spectral sequences. Prereq: 4190 and 5920.

6991 Seminar Analysis (1-3) Seminar in Numerical Mathematics (1-3) Open to graduate students with consent of department. Independent study under faculty guidance. May be repeated. Maximum 9 hrs.

6995 Seminar Applied Mathematics (1-3) May be taken for S/NC or letter grade. Note: Registration for seminars may be repeated with consent of instructor.

7000 Doctoral Research and Dissertation (3-15) P/NP only. E


6450-60-70 Partial Differential Equations (3, 3, 3) Advanced topics in classical and modern theoretical partial differential equations. Prereq or coreq: 5110-20-30 and 5210-20-30 or consent of instructor.

6570 Theory of Groups (3) Structure of groups, free groups, nilpotence and solvability, extensions and products, permutation groups, abelian groups. Prereq: 5520.

6610-20-30 Advanced Ordinary Differential Equations (3, 3, 3) Theory of ordinary differential equations from advanced viewpoint. Topics from current literature: Subject matter varies according to interests and preparations of students. Prereq or coreq: 5910-20-30 or 5210-20-30 or consent of instructor.


6810-20-30 Topological Algebra (3, 3, 3) Topics chosen from topological semigroups, topological groups. Lie groups; transformation groups; topological lattices; relations in topological spaces; topological rings, fields, algebras. Prereq or coreq: 5910-20-30.

6910-20-30 Modern Topology (3, 3, 3) Technical background to current literature in topology. Topics vary from year to year.

6940-50-60 Introduction to Algebraic Topology (3, 3, 3) Homology, cohomology, and homotopy theories. Homology and cohomology groups, the Eilenberg-Steenrod axioms, cup and cap products, duality theorems, homotopy equivalence, higher homotopy groups, fiber spaces, spectral sequences. Prereq: 4190 and 5920.

6991 Seminar Analysis (1-3)

6992 Seminar Topology (1-3)

6993 Seminar Algebra (1-3)

6995 Seminar Applied Mathematics (1-3)

6996 Seminar in Numerical Mathematics (1-3)

Note: Registration for 6000-level courses may be repeated with consent of department.

Microbiology

Major

Degree

Microbiology

M.S., Ph.D.

Professors:

A. Brown (Head), Ph.D. Chicago; R. W. Beck, Ph.D. Wisconsin; J. M. Becker, Ph.D. Cincinnati; T. C. Montie, Ph.D. Maryland; W. S. Riggsby, Ph.D. Yale; B. T. Rouze, Ph.D. Guelph (Canada); G. S. Scott, Ph.D. Idaho; J. M. Weis, Ph.D. (Emirius), Ph.D. Kansas; David C. White, Ph.D. Rockefeller; C. J. Wust, Ph.D. Indiana.

Associate Professors:

D. A. Bemis, Ph.D. Cornell; D. A. Brian, Ph.D. D.V.M. Michigan State.

Assistant Professors:

R. N. Moore, Ph.D. Texas (Austin); K. M. Shotkin, Ph.D. Michigan State; G. Stacey, Ph.D. Texas (Austin).

The Department of Microbiology offers both the M.S. and Ph.D. degrees. Students have the option of selecting from a variety of graduate research programs. For a complete list of research programs, contact the Graduate Program Coordinator.

Admission Requirements: Students are expected to have completed an undergraduate program with a 3.0 or better GPA on a 4.0 system. Included in the undergraduate course credits should be (1) a full year of general biological science, (2) one year of calculus, (3) two years of chemistry, including one year of organic, (4) one year of physics, and (5) an introductory course in microbiology. In many cases deficiencies in requirements may be remedied by taking appropriate courses during the first year of graduate study. The department also requires the general portion of the Graduate Record Examination. A satisfactory score on each part is 550 or higher. Exceptional students may be admitted with rare exceptions. Three letters of recommendation should be submitted by current or former faculty members.

The Graduate Program: Each new graduate student meets with an advisory committee chaired by the departmental Director of Graduate Studies to plan a program of study for the first one or two quarters until a research advisor is selected. All first year students participate in a laboratory rotation program during the first quarter of study. This program allows the student to adjust smoothly to the research programs of the department, to develop a background of research procedures and concepts, and to facilitate the selection of a research professor. Usually the student selects a research professor toward the end of the laboratory rotation period. The student is then involved in the selection of and carrying out of a suitable research program and in the naming of a thesis or dissertation committee.

The Master's Program:

The program leading to the M.S. degree is designed to provide the student with broad knowledge, to permit the acquisition of technical competence in the fundamentals of research, and to encourage creative and independent thinking. Two to three calendar years are usually needed for the course of study which has the following requirements: (1) 45 hours including thesis credits; (2) a 3.0 GPA in all courses taken for graduate credit after 18 hours of credit have been earned in courses graded on the A-F system; (3) a 3.0 GPA in courses taken in the department; (4) a complete course sequence in biochemistry; (5) coursework in at least five of the subdisciplines recognized by the department: microbial physiology, parasitism, microbial biochemistry, biochemistry and immunology, microbial genetics, microbial ecology, molecular biology, and applied microbiology; and (6) presentation of a research proposal and its oral defense.

The Doctoral Program:

The program leading to the Ph.D. degree is designed to develop the student's ability to pursue independent and original research in microbiology and allied fields, to teach both oral and written communication of the results of research to the scientific community, and to train effective teachers. Students may enter the program after receiving either a Bachelor's or Master's degree. Students who enter with a Bachelor's degree usually require four or five years; those with the Master's degree usually take three or four years to complete the degree. Departmental requirements are: (1) a 3.0 GPA in all courses taken for graduate credit; (2) a 3.0 GPA in courses graded on the A-F scale; (2) a 3.0 GPA in courses taken in the department; (3) satisfactory performance in at least one quarter as a research assistant; (4) two quarters of physical chemistry; (5) one course in statistics; (6) courses in at
least five of the sub-disciplines listed in the Master's program; (7) satisfactory performance in a comprehensive examination that must be passed before admission to candidacy; and (8) the presentation of a written research proposal and its oral defense.

4110 Physiology of Bacteria (3) Modern concepts of bacterial physiology and metabolism including cell structures and function. Prereq: 3700 and 12 hrs of organic chemistry. F

4119 Bacterial Physiology Laboratory (2) Prereq: 3519. Coreq: 4110. F

4120 Bacterial Diversity (3) Exploration of various bacterial groups and alternative strategies evolved with respect to physiology and metabolism. Prereq: One year of organic chemistry and 3700 or consent of instructor. Recommended prereq: 4110. W

4140 Molecular Genetics (3) Transmission and expression of genetic information at the molecular level. Emphasis is on bacterial and viral systems, but unique features of eukaryotic genetic systems are included. Prereq: 3700 or consent of instructor. W

4149 Techniques in Microbial Genetics (2) Practical experience in basic techniques in experimentation in microbial genetics. Coreq: 4140. W

4150 Microbial Ecology (3) Application of ecological principles to study of microbial communities. Emphasis is on the features of eukaryotic genetic systems are included. Prereq: 4110. F

4194 Microbiological Genetics Laboratory (3) Application of microbiological genetics. Coreq: 4140. W

4270 Immunology (3) Principles of inflammation and immunity, immunoglobulin structure and theories of formation, complement, hypersensitivities, cell cooperation in immune mechanisms, abnormalities of the immune system. Prereq: Biology 3120. (Same as Zoology 4720.) F

4279 Advanced Immunology Laboratory (2) Laboratory exercises designed to accompany 4270. Prereq or coreq: 4270. F

4320 Pathogenic Bacteriology (3) Disease producing microorganisms including bacteria, rickettsia, and chlamydia. Prereq: 3200. W

4329 Pathogenic Bacteriology Laboratory (2) Techniques for isolation, cultivation, and identification of pathogenic bacteria. Prereq: 3200. Coreq: 4329. W

4330 Medical Mycology (3) Disease-causing fungi; cytological, physiological and immunological emphasis; emphasis on methodology of isolation and identification. Prereq: 3700. Sp

4339 Medical Mycology Laboratory (2) Prereq: 3519. Coreq: 4339. Sp

4420 Molecular Virology (3) Molecular aspects of the replication, assembly and expression of viruses, with emphasis on bacterial phage. Prereq: 3700. F

4430 Medical Virology (3) General virology with emphasis on medical aspects. Prereq: 3200. Sp

4439 Medical Virology Laboratory (2) Laboratory procedures for isolation, handling and culturing of animal viruses. Prereq: 3519. Coreq: 4430. Sp

5000 Thesis (1-15) P/NP only. E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student who is otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N only. E

5011-12-13-14-15-16 Mini-course in Microbiology (1, 1, 1, 1, 1, 1) Selected, advanced topics in microbiology, concentrated in time and subject matter. Consult department for offerings. Prereq: as posted. May be repeated. Maximum 9 hrs. S/N only.

5135 Recombinant DNA (3) History, principles and basic discoveries leading to development of current recombinant DNA techniques. Basic plasmic and bacteriophage molecular biology applied to the development of recombinant DNA techniques. Prereq: 4140 or consent of instructor.

5190 Recombinant DNA Laboratory (3) Practical details and procedures applicable to recombinant DNA methodology and techniques. Utilization of available vectors, experimental conditions and killer immobilized nucleic acid hybridization. Prereq: Consent of instructor. (Same as Life Sciences 5139.)

5310 Selected Topics in Microbiological Research (3) Literature surveys and laboratory methods for development and interpretation of microbiological research. May be repeated.

5360 Topics in Immunology and Immunochromatography (4) Molecular and genetic aspects of immunoglobulin synthesis. Theoretical and practical exercise in inmunochrome. Prereq: 4270. Biochemistry 4110-20 or equivalent.

5510-20-30 Research Problems (3, 3, 3)

5720 Microbial Physiology (3) Lectures and seminars dealing with current advances in bacterial physiology including growth and cell structure. Prereq: 4110; Biochemistry 4110-20.

5730 Pathogenesis of Infectious Disease (3) Host responses to infection. Derangement of host-microbial interaction stimulated by microbial invasion, endotoxins, endotoxins and other factors related to virulence. Alteration of cellular integrity resulting from progressive infection. Prereq: 4320.

5750 The Oncogenic Viruses (3) Lectures and special laboratory exercises dealing with known tumor-inducing viruses. Prereq: 4430 or consent of instructor. 2 hrs and 1 lab.

5760 The Bacterial Viruses (3) Lectures and discussions dealing with bacterial viruses with emphasis on the biological and chemical consequences of bacteriophage infection. Text supplemented by readings from literature. Prereq: 4420. Biochemistry 4110-20.

5819 Molecular Genetics Laboratory (3) Principles and methods of research in molecular genetics. Fundamental genetic concepts (mutation, complementation, recombination) at molecular level. Studies of lactose operon of Escherichia coli. Prereq: 4140 and Biochemistry 4110-20 or consent of instructor.

5910-20-30 General Seminar (1, 1, 1) Reviews of current literature. May be repeated with consent of department. S/N only. E

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6310 Seminar in Immunology (1) Readings and discussions based on current literature. May be repeated. S/N only. E

6320 Seminar in Microbial Pathogenesis (1) Readings and discussions based on current literature. May be repeated. S/N only. F, W, Sp

6330 Seminar in Microbial Physiology (1) Readings and discussions based on current literature. May be repeated. S/N only. E

6340 Seminar in Microbial Genetics (1) Readings and discussions based on current literature. May be repeated. S/N only. E

6350 Seminar in Virology (1) Readings and discussions of current literature. May be repeated with consent of department. S/N only. E

6370 Current Topics in Environmental Microbiology (3) Reading, discussions, and critical evaluation of current literature. May be repeated. Maximum 8 hrs. S/N only. F

6410 Concepts of Immunity (3) Discussion and readings of recent advances in immunobiology and immunopathology.

6420 Current Topics in Biological Membrane Research (1) (Same as Biochemistry 6420.) S/N only.

6720 Advanced Topics in Microbial Physiology (3) Prereq: 5720. May be repeated with consent of department.

6730 Advanced Topics in Microbial Pathogenesis (3) Prereq: 5730. May be repeated with consent of department.

6740 Advanced Topics in Virology (3) Prereq: 4420 or 4430. May be repeated with consent of department.

6760 Advanced Topics in Microbial Genetics (3) Prereq: 6340. May be repeated with consent of department.

6810-20-30 Problem Seminar (1, 1, 1) Research problems and methods, critical analysis of experimental data and validity of conclusions. May be repeated with consent of department. S/N only.

Music

MAJOR

DEGREES

Music

M.M., M.A.

Professors: J. J. Meacham (Head), M.M. Northwestern; G. C. Bizas, M.M. Convers; J. P. Brock, M.M. Alabama; J. Coker, M.A. Sam Houston; F. M. Combs, M.A. Missouri; G. F. Dehler (Emeritus) Diploma, Schurz (Chicago); W. Dorn, M.A. Columbia; W. F. Frad, Ph.D. North Carolina; C. Hubbard, Ph.D. North Carolina; D. M. Pederson, Ph.D. Iowa.


Assistant Professors: W. Hawthorne, Ph.D. Cincinnati; D.M.A. Yale; J. Pindale, M.M. Northwestern; E. Schroeder, Ph.D. Stanford; G. M. Spirt, M.M. Indiana.

The Department of Music offers the degrees of Master of Music with concentrations in performance, accompanying, composition, theory, choral conduct, instrumental conduct, music literature, music business, church music and piano pedagogy and literature, and the Master of Arts with a major in Music with concentrations in theory and musicology.

Applicants for these degree programs must have completed an undergraduate degree approximately equivalent in music requirements to those required in degrees conferred by UT Knoxville, appropriate to the prospective area of concentration on the Master's level.

Applicants who plan to pursue the degree in performance (applied music) are required to audition before the appropriate area committee. Applicants for admission to the degree programs must submit scores and tape recordings of representative works. All applicants are required to take the Diagnostic Examinations in music theory and music history and literature.

Specific course requirements will be prescribed by the department for all degree programs and elective courses must have the approval of the student's advisor. Each student is responsible for the selection of his/her graduate committee. The student's
major area professor normally serves as chair of the Master's committee. One or two additional members from the major area (or related area, when necessary) serve on the committee along with one member from each of the remaining areas: music history, music theory, and music performance. When the student has chosen his/her committee, the Coordinator of Graduate Studies must be notified immediately in writing.

All concentrations require a written and oral comprehensive final examination.

THE MASTER OF MUSIC PROGRAM

The department requires a minimum of 45 quarter hours of coursework for the Master of Music degree. These hours are specifically distributed according to the area of concentration. All areas require coursework in music history/literature and/or theory and allows for elective courses. Music theory and composition require a thesis.

The choral conducting concentration requires a project and a seminar in choral performance. The instrumental conducting concentration requires a conducting performance and a seminar and practicum course sequence. All performance concentrations require a recital.

THE MASTER OF ARTS PROGRAM

The department requires a minimum of 45 quarter hours including 21 hours of coursework above the 5000 level and 9 hours of thesis. A reading knowledge of French or German must be demonstrated by applicants before being admitted to candidacy.

3122 Orchestration (3) Advanced techniques in instrumental writing with emphasis on scoring for the concert orchestra. Prereq: 3112 or consent of instructor.

3240 The Symphony (3) Survey of symphonic literature from precursors of classical symphony to present.

3260 Chamber Music (3) Survey of chamber music from 1750 to present.

3271-81 History of Opera (3, 3) Dramatic, vocal and orchestral elements in opera of Italian, French, and German School. 3271—1600-1800; 3281-1800 to 3271-81. History of Opera from precursors of classical symphony to present.

3385 Harpsichord (1-4)

3395 Composition with Electronic Media (1-3) Prereq: Consent of instructor.

3399 Composition (1-3) Prereq: Consent of instructor.

3500 Evolution of Jazz (3) Study of origin, development and styles of jazz music and its exponents.

4002 Suzuki Piano Method (2)

4003-04-05 The Organ and Its Literature (3, 3, 3) Development of keyboard organ literature from Middle Ages to present; problems of style and interpretation; pedagogical literature and methods; organ design. Prereq or coreq: 2310-20-30-40 and consent of instructor.

4035 Keyboard Literature Before 1750 (2) Survey of music for harpsichord and other keyboard instruments from Elizabethan period through J.S. Bach.

4036-37-38 Advanced Piano Literature (2, 2, 2) Piano music from pre-classic period to present. Prereq: Consent of instructor.

4040 Special Topics in Pedagogy (1-3) Prereq: Consent of department head. May be repeated. Maximum 6 hrs.

4041 Styles in Opera Acting (3) Study and practices of styles in opera acting based on historical and national characteristics. Prereq: 3015 or consent of instructor.

4045 Projects in Opera Theatre (1-3) Prereq: Consent of instructor. May be repeated.

4046-47-48 Song Literature (2,2,2) Study of song literature from 1750 to present including performance. Prereq: Consent of instructor.

4050 Advanced Instrumental Conducting (3) Development of knowledge and part literature in instrumental conducting; study of various periods and composers and relationship of different styles to the conductor's art; musical analysis and practice in conducting. Prereq: Music Education 4430 or equivalent.

4055-56-57 Elementary and Intermediate Piano Pedagogy (2, 2, 2) Piano methods and materials designed for teaching pre-college level students. Prereq: Consent of instructor.

4060 Advanced Choral Conducting I (3) Development of refinement of conducting techniques: chant and changing meters. Prereq: 4510 or equivalent.

4074 Music in Christian Worship (3) History and philosophy of church music; liturgies and liturgical music; music in non-liturgical worship. Prereq: Consent of instructor.

4084 Church Music Methods and Administration (3) Prereq: Consent of instructor.

4085 Harpsichord Techniques (1) Techniques literature, performance practice, continuous playing, and basic tuning and maintenance. Requires a thorough keyboard background. Prereq: Consent of instructor. May be repeated. Maximum 3 hrs.

4113 Pedagogy of Music Theory (3) Techniques, methods and materials involved in college-level theory programs. Prereq: Consent of instructor.

4117 Choral Arranging (3) Analysis of scores and writing of arrangements for men’s, women’s and mixed choruses. Prereq: 3112 or consent of instructor.

4124 Marching Band Arranging (3) Study and application of techniques employed in scoring for marching band. Prereq: 3112 or equivalent.

4134 Concert Band Arranging (3) Study and application of techniques employed in scoring for concert band. Prereq: 3112 or equivalent.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5001</td>
<td>Project in Choral Conducting Performance (1-3)</td>
<td>Public performance; critical document; recording project. May be repeated. Prereq: Consent of instructor. Must be taken in sequence.</td>
</tr>
<tr>
<td>5002</td>
<td>Non-Thesis Graduation Completion (3-15)</td>
<td>Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E</td>
</tr>
<tr>
<td>5003</td>
<td>Church Music Performance Project (1-3)</td>
<td>May be repeated. Maximum 3 hrs.</td>
</tr>
<tr>
<td>*5010</td>
<td>Organ Literature Seminar (3)</td>
<td>Topics vary. Prereq: Organ literature.</td>
</tr>
<tr>
<td>5012-22-32</td>
<td>Pedagogy of Voice (2, 2, 2)</td>
<td>5012: Survey of voice production processes in singing including: voice classification, quality, diction registration, breath support, and control. 5022: Examination of teaching materials, preparation of programs for various vocal categories and levels of study. Observation of studio teachings. 5032: Analysis of the vocal problems of a selected group of students. Supervised teaching. Prereq: 4012-22-32 or consent of instructor.</td>
</tr>
<tr>
<td>5020</td>
<td>Independent Study in Music History and Literature (1-3)</td>
<td>Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>5021</td>
<td>Introduction to Music Research (3)</td>
<td>Prerequisites and techniques of research. Required of all candidates with concentrations in musicology or in music theory recommended for all music students who intend to enroll in a doctoral program.</td>
</tr>
<tr>
<td>5022</td>
<td>Music Bibliography (3)</td>
<td>Bibliographic methods: illustrative projects in information retrieval and problem solving in music.</td>
</tr>
<tr>
<td>5023-32</td>
<td>Recital Project (2,2)</td>
<td>Preparation and accompaniment of full recital. 5231—Vocal recital. 5332—Instrumental recital. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>5050</td>
<td>Graduate Recital (3)</td>
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<tr>
<td>5051</td>
<td>Opera Performance (3)</td>
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<tr>
<td>5052</td>
<td>Vocal Chamber Music Performance (3)</td>
<td></td>
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<tr>
<td>5054-56</td>
<td>Lecture Recital (3)</td>
<td></td>
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<tr>
<td>5055-56</td>
<td>Practicum for Instrument Conductors (1, 1)</td>
<td>Intern experience in choral music and in an instrumental field other than the area of major interest. S/NC only.</td>
</tr>
<tr>
<td>5057</td>
<td>Instrumental Conducting Seminar (3)</td>
<td>Rehearsal and performance problems and techniques tailored to score reading and preparation. Particular attention to individual problems. Prereq: 4050 or equivalent.</td>
</tr>
<tr>
<td>5060</td>
<td>Advanced Choral Conducting II (3)</td>
<td>Expansion and continued refinement of conducting technique; development of choral rehearsal skills. Prereq: 4060 or consent of instructor.</td>
</tr>
<tr>
<td>5061</td>
<td>Choral Conducting Seminar (3)</td>
<td>Score reading and preparation: problems in interpretation, performance practices, and conducting techniques of individual. May be repeated. Prereq: 5060 or consent of instructor.</td>
</tr>
<tr>
<td>5081-82-84</td>
<td>Choral Literature (2, 2, 2)</td>
<td>Choral music from Middle Ages to present with consideration of historical development of major choral genres.</td>
</tr>
<tr>
<td>*5070</td>
<td>Opera Production (1-3)</td>
<td>Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>5080</td>
<td>Instrumental Conducting Performances (1)</td>
<td>Jury performance; conducting band or orchestra in public.</td>
</tr>
<tr>
<td>*5090</td>
<td>Special Topics in Performance (1-3)</td>
<td>Prereq: Consent of department head.</td>
</tr>
<tr>
<td>*5100</td>
<td>Independent Study in Music Theory (1)</td>
<td>Prereq: Consent of department head.</td>
</tr>
<tr>
<td>5110</td>
<td>History of Music Theory (3)</td>
<td>Work and contributions of theorists from ancient Greece to present. Emphasis on 1600 to present. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>5116</td>
<td>Musical Styles (3)</td>
<td>Elements of design and their role in definition of musical styles. Exercises in aural and visual identification. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>5121</td>
<td>Analytical Techniques (3)</td>
<td>Analytical techniques with emphasis on contemporary approaches. Tonal and neotonal music. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>*5126</td>
<td>Practicum in Computers and Music Research (3)</td>
<td>Programming languages, design and implementation of projects in musical analysis, composition and indexing. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>*5150</td>
<td>Seminar in Music Theory (3)</td>
<td>Topics vary. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>5200</td>
<td>Independent Study in Music History and Literature (1-3)</td>
<td>Prereq: Consent of department head.</td>
</tr>
<tr>
<td>5210</td>
<td>Introduction to Music Research (3)</td>
<td>Principles and techniques of research. Required of all candidates with concentrations in musicology or in music theory recommended for all music students who intend to enroll in a doctoral program.</td>
</tr>
<tr>
<td>5220</td>
<td>Music Bibliography (3)</td>
<td>Bibliographic methods: illustrative projects in information retrieval and problem solving in music.</td>
</tr>
<tr>
<td>5231-32</td>
<td>Recital Project (2,2)</td>
<td>Preparation and accompaniment of full recital. 5231—Vocal recital. 5332—Instrumental recital. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>5270</td>
<td>Composer Seminar (3)</td>
<td>Topics vary. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>5315</td>
<td>Band Literature (3)</td>
<td>Band literature and origins of band emphasizing its important, expanded cultivation during past century in United States and Europe.</td>
</tr>
<tr>
<td>5350</td>
<td>Music in the Middle Ages (3)</td>
<td>Emphasis on early and late Christian chant, medieval secular song, early and late Gothic, the development of polyphony and musical notation.</td>
</tr>
<tr>
<td>5352</td>
<td>Music in the Renaissance (3)</td>
<td>From 1400 to 1600. Mass, motet, cantata, madrigal, and other vocal and instrumental forms and genre.</td>
</tr>
<tr>
<td>5353</td>
<td>Music in the Baroque Period (3)</td>
<td>From 1600 to 1750; rise of opera and oratorio, church and secular cantata, instrumental forms, performance practice.</td>
</tr>
<tr>
<td>5355</td>
<td>Music in the Classic Period (3)</td>
<td>Preclassic music (Rococo) and music of Haydn, Mozart and early Beethoven. Includes background of other cultural and artistic activities.</td>
</tr>
<tr>
<td>5357</td>
<td>Music in the Romantic Period (3)</td>
<td>Survey from Beethoven through post-Romantic instrumental and vocal styles.</td>
</tr>
<tr>
<td>5359</td>
<td>Music in the Twentieth Century (3)</td>
<td>From 1890 (Debussy) to the present (Stockhausen and others).</td>
</tr>
<tr>
<td>5361-71</td>
<td>Ethnomusicology (3, 3)</td>
<td>Attitudes and techniques of ethnomusicology. Survey of music cultures throughout the world, interview and transcription projects. 5361—Pacific, Near East and Asia; 5371—Europe, Africa and Americas.</td>
</tr>
<tr>
<td>5400</td>
<td>Musical Aesthetics (3)</td>
<td>Nature of music and musical experience, sense perception and emotions, value in music, and role of artist in society. Aesthetic viewpoint of individuals and historical eras through selected writings.</td>
</tr>
<tr>
<td><strong>5500</strong></td>
<td>Flute (1-4)</td>
<td>*May be repeated.</td>
</tr>
<tr>
<td><strong>5505</strong></td>
<td>Oboe (1-4)</td>
<td>**May be repeated. Maximum 6 hrs.                                                                uality.</td>
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<tr>
<td><strong>5510</strong></td>
<td>Bassoon (1-4)</td>
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</tbody>
</table>
Philosophy

MAJOR

Philosophy

MA., Ph.D.

Graduate credit by philosophy majors except for studies. Details concerning the program can be obtained from the department in medical ethics. Details concerning the program of graduate study with a concentration in medical ethics. The student's faculty committee.

THE MASTER'S PROGRAM

The department offers both an M.A. with a thesis and a non-thesis M.A. The latter is available only to students who have passed the doctoral comprehensive and are ready to begin writing a dissertation, but who have not written a Master's thesis.

THE DOCTORAL PROGRAM

Specific requirements for doctoral students in Philosophy include a minimum of three academic years of graduate study involving at least 72 quarter hours credit in course work (normally 18 quarter courses or their equivalent, exclusive of credit for the thesis and dissertation) of which no fewer than 45 hours shall be in courses numbered over 5000. The specific number and distribution of courses will be determined by the student's faculty committee.

Doctoral students must demonstrate competency in one foreign language, normally French or German. This may be done by passing the doctoral language examination administered by the Romance Language or German Departments, or by passing French 3030 or German 3030 with a B or better. In special circumstances and upon petition by the student, the department's graduate committee may accept a substitute language for French or German.

MEDICAL ETHICS

The department has an M.A. and Ph.D. program of graduate study with a concentration in medical ethics. Details concerning the program can be obtained from the department.

RELIGIOUS STUDIES

The department has an M.A. program of graduate study with a concentration in philosophy of religion and other religious studies. Details concerning the program can be obtained either from the Philosophy or Religious Studies Departments.

Courses below 4000 may not be taken for graduate credit by philosophy majors except with special permission.

Registration in any course in the 5000 or 6000 series (except 5050) may be repeated for credit with the consent of the department. That is, courses having the same number, but with a different subject matter, may be taken with each separate subject description.

3111 Ancient Western Philosophy (4) F
3121 Medieval Philosophy (4) F
3131 Seventeenth- and Eighteenth-century Philosophy (4) E

3141 Nineteenth-century Philosophy (4) F, Sp
3151 Contemporary Philosophy (4) Survey of recent movements in philosophy. F
3311-12 American Philosophy (4, 4) 3311—Colonial to late nineteenth century. 3312—Late nineteenth century to present. W, Sp
3320 Philosophy of Law (4) Nature, sources, function of law. A
3330 Philosophy of History (4) Speculative and critical aspects of the philosophy of history. A
3410 Philosophical ideas in Literature (4) Philosophical assumptions and implications in major literary works. F, W, Su
3420 Philosophy of Literature (4) Study of the nature, functions, value and epistemic principles of literary arts. A
3430 The Concept of Woman (4) Nature of woman as conceived by major western philosophers from Plato to Simone de Beauvoir. (Same as Women's Studies 3430.) F, W
3510 Existentialism (4) E
3550 Marxism as Philosophy (4) W
3590 Business Ethics (4) Ethical problems as they confront both business as social institution and individuals in business. May not be taken for graduate credit by philosophy majors. Sp
3605-06 Professional Responsibility (4, 4) 3605—Critical analysis of selected classic texts from philosophy, religious studies, and social sciences; nature of responsibility, professionalism, and application of concepts of responsibility to professional activity. Illustrations from variety of professional fields of practice. 3606—Application of theoretical principles and analytical skills developed in 3605 to selected case studies and other detailed descriptions of professional practice from following professional fields: Engineering/Architecture; Business/Accounting; and at least one of (a) Law/Politics; (b) Helping Professions (Social Work, Human Services, Religious Ministry); (c) Teaching. (Same as Religious Studies 3605-06.)
3650 Philosophy and Religion in India (4) (Same as Religious Studies 3650.) F
3660 Buddhist Philosophy and Religion (4) (Same as Religious Studies 3660.) W
3671 Religion and Philosophy in China (4) (Same as Religious Studies 3671.)
3690 Philosophy of Religion (4) Analysis of basic issues of religion. (Same as Religious Studies 3690.) F, Sp, Su
3740-50 Conceptual History of Science (4, 4) 3740—The Scientific Revolution: historical evolution of thought in astronomy, mechanics and philosophy of nature up to Newton. 3750—The development and decline of Newtonian science: historical evolution of thought on the nature of matter and of light, and on that of life. Prereq: 8 hrs of physical science or consent of instructor. F, W
3770 Introduction to Philosophy of Science (4) Standard topics in philosophy of science: scientific method, nature of laws and theories, problems of induction, explanation, measurement. No background in logic presupposed. F
3810 Symbolic Logic (4) Techniques for formal analysis of deductive reasoning (propositional logic and quantification theory). Sp Prereq: 1810 or 2510 or consent of instructor
3910 Contemporary Aesthetics (4) Philosophical discussion of contemporary art. F, W, Sp
4000 Special Topics (4) A student- or instructor-initiated course to be offered at convenience of department. Subject matter to be determined by mutual consent of students and instructor with approval of department. Prerequisites to be determined by department. May be repeated.
4111-21 Modern Religious Philosophies (4, 4) (Same as Religious Studies 4111-21.)
4200 Classical Indian System of Philosophy: The Moksha Tradition (4) (Same as Religious Studies 4200.)
4310 Intermediate Ethics (4) Topics in metaethics or ethics.
4370 Theoretical Issues in Medical Ethics (4) Prereq: 2310 or 3611 or consent of instructor. (Same as Religious Studies 4370.) Sp
4410 Plato (4) Prereq: 8 hrs philosophy or consent of instructor. A
4420 Aristotle (4) Prereq: 8 hrs philosophy or consent of instructor. A
4450 Continental Rationalism (4) Prereq: 8 hrs philosophy or consent of instructor. A
4460 British Empiricism (4) Prereq: 8 hrs philosophy or consent of instructor. A
4470 Kant (4) Prereq: 8 hrs philosophy or consent of instructor. A
4480 Advanced Topics in Existentialism and Phenomenology (4) Prereq: 8 hrs philosophy or consent of instructor.
4511 Advanced Topics in Logic (4) Prereq: Consent of instructor. May be repeated.
4620 Philosophy of Mind (4) Problems of mind and body in relation to consciousness and personal identity. Prereq: 8 hrs philosophy or consent of instructor.
4630 Philosophy of Language (4) Prereq: 8 hrs philosophy or consent of instructor.
4710 Philosophy of Natural Science (4) Consideration of standard topics pertinent to natural science including reduction of theories and teleological explanation. Familiarity with symbolic logic is recommended. Prereq: 3770 or 2 yrs natural science.
4720 Philosophy of Social Sciences (4) Examination of methods of inquiry and modes of explanation in social sciences. Prereq: 3770 or 2 yrs social science.
4810 Contemporary Metaphysics and Epistemology (4) Prereq: 8 hrs philosophy or consent of instructor.
5000 Thesis (1-15) P/NP only. E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise required—during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
5050 Symbolic Logic (4)
5080 Philosophy of Logic (4) Nature of logic: epistemological, metaphysical and axiomatic assumptions and implications in various theories of logic. Prereq: 4510 or equivalent.
5101 Foreign Study (1-12) See page 104. E
5102 Off-campus Study (1-12) See page 104. E
5103 Independent Study (1-12) See page 104. E
5110-20-30-40-50-60 Studies in the History of European Philosophy (4, 4, 4, 4, 4, 4) Intensive critical work on major philosopher or school. 5110—Greek. 5120—Hellenistic or Medieval. 5130—Modern, before Kant. 5140—Kant. 5150—Nineteenth Century. 5160—Twentieth Century.
5250 Studies in the History of American Philosophy (4) Intensive, critical work on major philosopher or school.
5335 Orientation to Medical Ethics (4) Survey of ethical theories in application to issues in medical ethics. Consent of Medical Ethics Committee required. (Same as Religious Studies 5335) F

5365 Applied Ethical Theory (4) Single author, tradition, or topic in ethical theory with special attention to application to issues in health, business, technology, ecology, and other practical fields. (Same as Religious Studies 5365) W

5370 Topics in Medical Ethics (4) Prereq: 4370 or consent of Medical Ethics Committee.

5375 Clinical Medical Ethics (2) Medical terminology, history of medical ethics, case study discussions, clinical observation. Open only to students concentrating in medical ethics. Prereq: 5335 and consent of Medical Ethics Committee. May be repeated. Maximum 8 hrs. S/NC only.

5410 Philosophy of History (4) Theories of history and historical processes.

5430 Philosophy and Literature (4) Mutual influence of philosophy and literature, possibility of a philosophy of literature, philosophy of criticism.

5450 The Problem of the Self (4) Current studies in sociology, social psychology, and philosophy of mind. 8 hrs. S/NC only.

5460 Philosophy of Mind (4) Relation of mental to physical and of role of words in discourse for mental activities such as thinking and feeling.

5550-56 Philosophy of Science (4, 4) Nature of subject matter and method of sciences. 5550—Natural sciences. 5560—Social sciences.

5610 Recent Developments in Philosophy of Religion (4)

5710 Studies in Metaphysics (4)

5720 Studies in Epistemology (4)

5810 Social and Political Philosophy (4)

5940 Lakeshore Clinical Residence (6) Seven-week clinical practicum at Lakeshore Mental Health Institute concentrating on ethical issues in mental health care. Open only to students concentrating in medical ethics. Prereq: Consent of Medical Ethics Committee. S/NC only.

5950 Clinical Practicum in Medical Ethics (4-12) Prereq: Consent of Medical Ethics Committee. Open only to students concentrating in medical ethics. SC/NC only.

6000 Doctoral Research and Dissertation (3-15) P/ NP only. E

6110-20-30 Seminars in the History of European Philosophy (4, 4, 4)

6150 Seminars in the History of American Philosophy (4)

6250 Seminar in the Philosophy of Religion (4)

6310 Seminar in Axiology (4)

6370 Advanced Topics in Medical Ethics (4) Prereq: 5370 or consent of Medical Ethics Committee.

6510 Seminar in Epistemology (4)

6550 Seminar in Philosophy of Science (4)

6950 Advanced Residence in Medical Ethics (4-12) Prereq: Consent of Medical Ethics Committee. Open only to students concentrating in medical ethics. S/NC only.

**Phyics and Astronomy**

**MAJOR**

**DEGREES**

Physics

M.S., Ph.D.

Professors:

W. M. Bugg (Head), Ph.D. Tennessee.


Associate Professors:


Assistant Professors:

C. Breinig, Ph.D. Oregon; J. Burgdorff, Ph.D. Frie Universitat Berlin; R. DeSerio, Ph.D. Chicago; T. Farrell, Ph.D. Clemen's; S. Nave, Ph.D. Tennessee.

*Alumni Distinguished Professor*

*Space Institute, Tulahoma.*

*Distinguished Scientist, Science Alliance Center of Excellence.*

*Chancellor's Research Scholar.*

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy are offered in a number of concentration areas: atomic and low temperature physics, biophysics, chemical physics, elementary particle physics, health physics, heavy ion atomic physics, liquid state physics, molecular spectroscopy, nuclear physics, plasma physics, solid state physics, theoretical physics, and ultrasonics.

Graduate students specializing in nuclear physics, Physics 6500-10 of students in plasma physics, Physics 6610-20 of students in health physics, Physics 6710-20 of students in solid state physics, and Physics 6810-20 of students specializing in molecular spectroscopy.

Students must pass a comprehensive examination normally taken after two years of graduate study. A Master's degree is not required for the doctorate.

A reading knowledge of one foreign language in which there exists a significant body of literature is required. German or French 3030 with a grade of A or B may be substituted for the corresponding language examination.

A thesis topic will be chosen with reference to one of the fields in which research facilities can be made available at the University Laboratory, the U. T. Space Institute, and the Oak Ridge National Laboratory, Oak Ridge, Tennessee.

A program leading to the Ph.D. in chemical physics is conducted jointly with the Chemistry Department, which offers a similar degree. Physics departmental requirements for the degree in chemical physics include the successful completion of: Physics 4510, 4640-50-60, 5210-20-30, 5310-20-30, 5410-20-30, 5510-20-30, 5610-20-30, 6110-20-30, and 5720; Chemistry 4160-70, 5430, and any two quarters from 5340-50, 6730 or 6810-20.

**Astronomy**

Phys 4540-50 Experimental Nuclear and Radiation Physics (4, 4) A detailed treatment of photodetector devices and radioactive sources; theory and characterization of detectors; statistics of counting; nuclear processes; and techniques for investigating the nucleus and nuclear radiation. Prereq: Thru 3720, 1 hr and 6 hrs lab. F; Su

4580 Principles of Nondestructive Testing (3) Detection and characterization of discontinuities in materials by nondestructive physical measurements. Ultrasonic, magnetic, holographic and penetrating radiational techniques are discussed. Prereq: Thru 3720-20 or consent of instructor. [Same as Engineering Science 4580] W

4590 Magnetic Induction Phenomena (3) Theory and applications of magnetic induction phenomena: nondestructive testing with eddy currents, induction heating, magnetic levitation, forming, pumping, and flow measurement. Prereq: Thru 4320 or equivalent, 2 hrs and 1 lab. [Same as Engineering Science and Mechanics 4590]

4640 Kinetic Theory (3) Transport properties: distribution of scattering theory and classical distribution function. Prereq: Thru 3230 or equivalent.

4650 Statistical Mechanics (3) Elementary methods of statistical mechanics applied to modern systems to derive thermodynamic functions and relations between observed properties. Required prereq: Thru 4640. Prereq: Thru 3230.

4660-70 Solid State Physics (3, 3) 4660-Symmetry and crystal structure, lattice dynamics, specific heat. 4670-Electronic properties of metals and other crystals. Classic and experimental properties. Must be taken in sequence. Prereq: Thru 3230 or equivalent.

4710-20-30 Introduction to Health Physics (3, 3, 3) Radioactivity, interaction of electromagnetic radiation with matter, radiation quantities and units, point source and extended sources, x-rays and gamma rays, neutron activation, interaction of charged particles with matter, stopping power, range-energy relations, counting statistics, shielding, dosimetry, waste disposal, criticality prevention, radiation biology and ecology. Prereq: Thru 4700, F, W, Su

5000 Thesis (1-15) P/NP only. E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student does use university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5080 Graduate Research Participation (3) Advanced research techniques under supervision of staff research director whose research area coincides with interests of student and in which student is in good standing. Consent of department and research director must be obtained. May be repeated with consent of department. E

5110-20-30 Introduction to Theoretical Physics (3, 3, 3) Classical theoretical physics, with limited use of mathematics. Prereq: Thru 3110-20, 4310-20; advanced calculus, differential equations, and vector analysis. F, W, Su

5210-20-30 Advanced Modern Physics (3, 3, 3) Basic principles of wave mechanics; one-electron atom; vector model; atomic and molecular spectroscopy; molecular binding; relativity; properties of nuclei and quantum mechanics; scattering phenomena; nuclear models and forces; high-energy physics. Prereq: Thru 5310-20, 3710-20-30, 4310-20, differential equations. Must be taken in sequence. F; Su

5310-20-30 Advanced Dynamics (3, 3, 3) Equations of Lagrange and Hamilton, variational principles, two-body problem, rigid body mechanics, special relativity, canonical transformations, normal coordinates, elasticity, fluid mechanics. Prereq or coreq: Thru 5620-20-30, F; Su


5440 Experimental Methods of Infrared and Raman Spectroscopy (3) Experimental equipment: instrumen tally appropriate: detectors; systems; analytical methods. Analysis of vibrating-rotating diatomic molecule. Prereq: Thru 3710-20 or equivalent.

5510-20-30 Advanced Thermodynamics and Statistical Mechanics (3, 3, 3) Fundamental principles of the statistical mechanics of matter; thermodynamic foundations of statistical mechanics; phase space; free energy and chemical equilibria. Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac statistics. Ensemble theory; relation of statistical mechanics to thermodynamics; distribution functions and partition functions. Applications to gases, liquids and solids, including cluster theory of imperfect gases. Prereq: Thru 3230. Prereq or coreq: Thru 5310-20, 5610-20-30, F; W, Sp

5610-20-30 Mathematical Methods in Physics (3, 3, 3) Vector and tensor analysis; linear algebra; matrics, vector spaces; Fourier series and integrals; spherical harmonics; Bessel functions; linear second-order partial differential equations and their associated boundary value problems. Special points, canonical solutions; integral transform methods. Special attention to problems arising in physics. Prereq: Advanced calculus and differential equations. [Same as Mathematics 5610-20-30, F; W, Sp

5640 Numerical Methods in Physics (3) Numerical methods available for solution of physical problems, particularly toward use of automatic computing machinery; analysis of errors. Prereq: Thru 5610-20-30, or consent of instructor.

5720 Physics of Polyatomic Molecules (3) Introduc tion to electronic structure of molecules and physical processes of luminescence for these molecules; theoretical and experimental aspects of intermolecular and intramolecular electron excitation energy transfer and charge transfer; how to use energy transfer and charge transfer in such fields as organic molecular reactivity and organic scintillation. Prereq: Thru 5210-20 or consent of instructor. Sp

5910-20-30 Special Problems (3, 3, 3) Specially assigned theoretical or experimental work on problems not covered in other courses. E


6000 Doctoral Research and Dissertation (3-15) Prereq: S/NC only. P

6110-20-30 Quantum Mechanics (3, 3, 3) Fundamental principles of quantum mechanics and principal approximation methods. Applications to atomic, molecular and nuclear physics. Dirac equation, quantum electrodynamics. Prereq: Thru 5410 or 5210; 5310-20-30 or 5410-20-30. Whatever of latter series not used as prerequisite is considered corequisite. F, W, Su

6210-20-30 Nuclear Structure (3, 3, 3) General properties of nuclei; two-body scattering problems; saturation and symmetry properties of nuclear forces; theory of light nuclear; nuclear spectroscopy; special nuclear models; elementary particles; theory of beta-decay. Prereq: Thru 6110-20-30. F, W, Sp

6270-80 Elementary Particle Physics (3, 3, 3) General physics of elementary particles; experimental methods; conservation laws; invariance principles; hadronic interactions; quark models; electroweak interactions; unification of elementary forces; attention to interplay between experiment and theory. Prereq or coreq: Thru 6110-20-30, F, W, Sp

6310 Electromagnetic Theory of Light (3) Classical electron theory including theories of line breadth, dispersion, absorption, and scattering of light and x-rays; electric and magnetic properties of gases and solids. Optical properties of electromagnetic waves in isotropic media including reflection, refraction and polarization; and also theory of diffraction. Prereq: Thru 5410-20-30, Su
6320 Special Relativity (3) Lorentz transformation; Einstein postulate; relativistic tensors; relativistic electrodynamics. Prereq: 5310-20-30, 5410-20-30. 6310. F

6330 General Relativity (3) Tensor calculus; general theory of relativity; gravitational field equations. Prereq: 6320. W

6420 Advanced Topics in Classical Theory (3) To meet special needs of students. Possible fields: advanced dynamics and hydrodynamics, electromagnetic theory, statistical mechanics, including theory of non-equilibrium processes. Prereq: 5310-20-30, 5410-20-30, 5510-20-30. May be repeated with consent of department.

6430 Advanced Topics in Quantum Theory (3) To meet special needs of students. Possible topics: angular-momentum theory, beta-ray theory, theory of atomic spectra, molecular structure and valence theory, theory of radiation, electric and magnetic susceptibilities, high energy processes, scattering and collision processes, theory of fields. Prereq: 6110-20-30. May be repeated with consent of department.

6500-10-20 High Temperature Plasma Physics (3,3,3) Ph.D. Oklahoma; P. Haas, Ph.D. Utah; V. M. Robertson (Emeritus); Ph.D. Syrause; T. A. Smith, Ph.D. Ohio State; O. H. Stephens,** Ph.D. Johns Hopkins; D. M. Welshon, Ph.D. Texas.


*Distinguished Professor. **Alumn Distinguished Professor.

The Department of Political Science offers the M.A., M.P.A., and Ph.D. degrees. Inquiries concerning all programs should be directed to the departmental office.

Admission Requirements: Three departmental recommendation forms must be submitted to The Graduate School, at least two of which must be completed by instructors at the institution most recently attended by the student. In addition, scores for the general part of the Graduate Record Examination must be submitted.

THE MASTER OF ARTS PROGRAM

Each candidate must earn 36 quarter hours in coursework and 9 hours of Thesis. The M.A. degree is restricted to programs of study in which research is a major element. The M.A. degree is awarded to students who have completed at least 36 quarter hours. A maximum of 12 quarter hours may be transferred to the M.A. degree program.

THE MASTER OF PUBLIC ADMINISTRATION PROGRAM

The M.P.A. degree is a non-thesis program. Fifty-four quarter hours are required, consisting of a 30-hour core, a 15-hour elective specialized track, and a recommended 9-hour quarter-hour internship with a public agency lasting 3-6 months. Possible specialized tracks include general government, public health, budgeting and finance, planning, natural resources, program evaluation, criminal justice, public relations, personnel, and others.

The written comprehensive examination may be followed by an oral examination.

THE DOCTORAL PROGRAM

A minimum of 117 quarter hours following the Bachelor's degree is required. At least 72 hours in political science shall be in 5000-6000-level courses, and at least 45 hours shall be at the 6000 level. This figure includes 36 hours of credit for the dissertation.

Each Ph.D. candidate must pass an examination in one foreign language. Admission to candidacy shall be based on a written and oral comprehensive examination which must be passed not later than three years before the date on which the degree is granted. The candidate must also pass a final oral examination on the doctoral dissertation. Successful completion of the degree also depends on course performance and other evidence of professional interest and conduct.

THE BUREAU OF PUBLIC ADMINISTRATION

The University maintains in the College of Liberal Arts/Physics 6541 United States Constitutional Law: Sources of Power and Restraint (4) Analysis of judicial review, constitutional powers of President and Congress, federalism, sources of regulatory authority, and constitutional protection of political rights. Recommended prereq: 2510-20. F, W.

3546 U.S. Constitutional Law: Civil Rights and Liberties (4) Judicial interpretation of first amendment, equal protection clause of fourteenth amendment and right to privacy.

3555 Minority Group Politics in the United States (4) Content varies from quarter to quarter. May be repeated with consent of department. Maximum 8 hrs. W.

3560 Introduction to Public Administration and Policy Making (6) Introduction to public administration, policy making, and public administration and policy making. F.


3570 Political Change in Developing Areas (4) Characteristics and problems of political changes with primary focus on developing areas. F, Sp.

3570-16 Dynamics of Black African Politics (4, 4) W

3572 Government and Politics of the People's Republic of China (4) Chinese political setting, political structures, participation and selected policy areas.

3525-26 Latin American Government and Politics (4) W, F.

3531-32 Government and Politics of the Soviet Union (4, 4) W

3535-36 Politics in Western Democracies (4) Political culture, patterns, and institutions of Western democratic systems. F, W.

3710 State Politics (4) Focus on formal and informal setting of state government. State government's role in formulating, enacting, and implementing state policy. F.

3720 State Government and Policy Making (4) Nature and functions of the institutions of state government: governors, courts, legislatures, and state administrators. Attention will be paid to state government's role in formulating, enacting, and implementing state policy. W.

3750 The Urban Polity (4) Analysis of political institutions and processes in metropolitan areas. W

3760 Urban Policy Process (4) Analysis of urban problems and policies in metropolitan areas. Sp

3796 Contemporary Problems of Soviet Foreign Policy (4) Sp

3801 Studies in Ancient Political Thought (4) Classical Greek and Roman political thought. F

3802 Studies in Medieval Political Thought (4) From Augustine to Luther: emphasis on problems and theories of religion and politics. W

3803 Studies in Early Modern Political Thought (4) Machiavelli through the Enlightenment. W
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>5150-20</td>
<td>Seminar in World Politics (3, 3) Research in world problems and organization</td>
<td>F, W, Sp</td>
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<tr>
<td>5211</td>
<td>Directed Readings in Political Science (3) May be repeated with consent of</td>
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<td>instructor and student's advisor. Maximum 9 hrs. May be taken for letter</td>
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<td>grade or S/NC.</td>
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<tr>
<td>5250</td>
<td>Seminar in African Politics (3) Selected topics in African politics.</td>
<td>F</td>
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<td>5270</td>
<td>Seminar in the Politics of Development (3) Selected topics dealing with</td>
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<td>political problems of less developed countries.</td>
<td>W</td>
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<tr>
<td>5310</td>
<td>Seminar in Comparative Government (3) Selected topics in modern governments.</td>
<td>F</td>
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<td>5340</td>
<td>Seminar in Latin American Government (3)</td>
<td>F</td>
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<td>5370</td>
<td>Seminar in Soviet Politics and Government (3)</td>
<td>W</td>
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<td>5410-20</td>
<td>Seminar in Public Law (3, 3) Special problems in constitutional and</td>
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<td>administrative law.</td>
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<td>5440</td>
<td>Theory and Analysis of U.S. Foreign Policy Processes (4) Theoretical</td>
<td>F</td>
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<td>approaches to decision making in foreign policy area and analysis of</td>
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<td>policy-making process.</td>
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<tr>
<td>5540</td>
<td>Seminar in Comparative Public Administration (3) Approaches to and methods</td>
<td>W</td>
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<td>used in comparative analysis.</td>
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<tr>
<td>5600</td>
<td>Public Administration (3) Public administration theory and functions,</td>
<td>F</td>
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<td>approaches to public management,</td>
<td>W</td>
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<td>contemporary problems in public administration.</td>
<td>E</td>
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<td>5605</td>
<td>Research and Methodology in Public Administration (3) Basic assumptions and</td>
<td>F</td>
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<td>techniques of research in public administration; measurement, analysis, and</td>
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<td>reporting of data.</td>
<td>E</td>
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<tr>
<td>5610</td>
<td>Seminar in Organization Theory (3) Appraisal of major theories of</td>
<td>F</td>
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<td>organization and their applicability to public sector.</td>
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<td>5611</td>
<td>Seminar in State-Local Administration (3)</td>
<td>F</td>
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<td>5645</td>
<td>Operations Research for Public Administrators (3) Research into selected</td>
<td>F</td>
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<td>topics in public administration; measurements,</td>
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<td>transportation, and assignment problems, network analysis, and other</td>
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<td>methods.</td>
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<tr>
<td>5640</td>
<td>Seminar in Metropolitan Areas (3)</td>
<td>F</td>
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<tr>
<td>5641</td>
<td>Seminar in Contemporary Public Policies (3) Problems in one or more</td>
<td>F</td>
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<td>public policy areas from political and administrative perspectives. Topics</td>
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<td>selected by instructor.</td>
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<td>5670-80</td>
<td>Seminar in Policy Analysis (3, 3) Role of administrators in policy analysis</td>
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<td>and decision making with special attention to historical and current issues.</td>
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<td>5710</td>
<td>Seminar in the Politics of Administration (3) Examination of public</td>
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<td>administration in context of American political system with emphasis upon</td>
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<td>policy making and political roles of public administrators and agencies.</td>
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<td>5730</td>
<td>Seminar: Public Budgeting (3) Technical and political aspects of planning,</td>
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<td>preparing, and adopting government budgets.</td>
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<td>5735</td>
<td>Seminar: Public Financial Management (3) Management of public expenditures</td>
<td>F</td>
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<td>and management implications of revenue collection, debt management,</td>
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<td>taxation, function, accounting, internal auditing, purchasing, risk</td>
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<td>management, post-auditing.</td>
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<td>5740</td>
<td>Seminar in Organizational Analysis (3) Organization theory applications in</td>
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<td>public management; field analysis of public organizations.</td>
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<td>5750-55</td>
<td>Seminar in Public Management (3, 3) Selected problems.</td>
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<td>5765</td>
<td>Law and the Administrative Process (3) Constitutional position; decisional</td>
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<td>processes, regulation and management; limitations on governmental action;</td>
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<td>questions of structure, role, and administrative choice.</td>
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<td>5790</td>
<td>Seminar in Public Personnel Management (3) Functions and organizations of</td>
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<td>personnel administration in public service.</td>
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<td>5810</td>
<td>The American Political Process (4) Principal patterns of political activity</td>
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<td>linking citizens and political institutions.</td>
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<td>5820</td>
<td>The American Political Process (4) Selected problems in American politics.</td>
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<td>5831-32</td>
<td>The Systematic Study of Politics (3, 3) Scope, methods, and procedures of</td>
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<td>analysis in political science.</td>
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<td>5840</td>
<td>Ethics, Values, and Morality in Public Administration (3) Moral-ethical-value</td>
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<td>dilemmas confronting administrators in American political system.</td>
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<td>5850</td>
<td>Seminar in Comparative State Politics (3) Intensive readings in comparative</td>
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<td>state politics focusing on environment of state politics, institutions and</td>
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<td>policy making.</td>
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<td>5910-20</td>
<td>Quantitative Political Analysis (3, 3) Methods and techniques in</td>
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<td>quantitative political analysis.</td>
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<td>6000</td>
<td>Doctoral Research and Dissertation (3-18) P/ NP only.</td>
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<td>6210</td>
<td>Advanced Studies in International Politics (3)</td>
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<td>6310</td>
<td>Advanced Studies in Political Theory (4) Research into selected topics.</td>
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<td>6440</td>
<td>Advanced Studies in Comparative Politics (3) Research into selected topics.</td>
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<td>6510-20</td>
<td>Advanced Studies in American Constitutional Law (3, 3) Systematic investigation</td>
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<td>of federal relationships, civil liberties, courts in political settings,</td>
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<td>judicial institutions, personnel, and public policy content.</td>
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<td>6610</td>
<td>Advanced Studies in Public Administration (3) Research into selected topics.</td>
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<td>6670</td>
<td>Directed Research in Political Science (3) May be repeated with consent of</td>
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<td>instructor and student's advisor. Maximum 9 hrs. May be taken for letter</td>
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<td>grade or S/NC.</td>
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<td>6810-20</td>
<td>Advanced Studies in the Political Process (3, 3) Open to advanced graduate</td>
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<td>students upon approval of instructor.</td>
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**Psychology**

**MAJOR**

DEGREES

Psychology

M.A., Ph.D.

Professors:

W. H. Calhoun (Head), Ph.D. California (Berkeley);

G. M. Burghart, Ph.D. Chicago; A. G. Burstein, Ph.D. Chicago; J. F. Byrne, Ph.D. Tennessee;

C. F. Cohen, Ph.D. Kansas; H. J. Rowe, Ph.D. Illinois; J. D. Brown, Ph.D. Washington;

D. S. Freeman, Ph.D. Tennessee; M. G. Johnson, Ph.D. Tennessee; L. Handler, Ph.D. Michigan State;

J. E. Lawler, Ph.D. North Carolina; R. P. Lonon, Ph.D. Rochester; J. F. Lubar, Ph.D. Chicago;


N. L. Rasch, Ph.D. Pennsylvania; F. Samojima, Ph.D. Keio (Japan); R. R. Strader, Ph.D. Tennessee;

E. D. Sundstrom, Ph.D. Utah; W. S. Verplank (Emeritus), Ph.D. Brown;

R. G. Wahter, Ph.D. Washington; J. A. Wiberley, Ph.D. Syracuse.

Associate Professors:

J. M. Barlow, Ph.D. Tennessee; N. W. Dye, Ph.D. Tennessee; E. A. Ellett, M.S.W. Tennessee;

D. S. Freeman, Ph.D. Tennessee; M. G. Johnson, Ph.D. Tennessee; K. A. Lawler, Ph.D. North Carolina;

S. Loucks, Ph.D. Tennessee; J. W. Lounsbury, Ph.D. Michigan State; A. McIntyre, Ph.D. Yale;

W. G. Morgan, Ph.D. Tennessee; M. J. O'Connell, Ph.D. Tennessee; R. S. Saudargas, Ph.D. Florida State;

C. S. Travis, Ph.D. California (Davis).

Assistant Professors:

L. T. Laurence, Ph.D. Tennessee.

*Part-time.*
The Department of Psychology offers the Doctor of Philosophy degree with concentrations in clinical, school, community, social, developmental, experimental, cognitive, physiological, and comparative psychology, psycholinguistics, psychometrics, and learning. The department does not normally admit students to the Master's program; however, a Master's may be earned as part of the doctoral program. For detailed information, write to the Department of Psychology.

THE DOCTORAL PROGRAM

Requirements for the Ph.D. are:

1. During the first year, students are expected to complete a one-year sequence in statistics, with options offered either by the Departments of Psychology, Statistics, or Educational and Counseling Psychology.
2. All students must, before beginning the second year of study, achieve a score at the 85th percentile or more on the Psychology portion of the GRE.

THE PSYCHOLOGICAL CLINIC

The Psychological Clinic supports graduate training in clinical psychology. Psychological diagnosis and psychotherapy are offered on an outpatient basis, with medical consultants, to the general public as well as to University students, upon referral by a physician.

3720 Ethology and Sociobiology (3) Evolutionary approach to behavior; emphasis on special reference to controversial issues in applications to psychology, social sciences, and arts.

4107 Experience in Individual Instruction (1-4) Experience as proctor in individualized instruction. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. S/N/C only, E.

4120 Topics in Social Psychology (3) Intensive analysis of selected research topics. Prereq: 3120 or Sociology 3130. (Same as Sociology 4120.)

4330 Sensory Processes and Perception (3) Survey of sensory and perceptual processes with emphasis on audition and vision. Prereq: 3150. Recommended: 2520. F.

4329 Laboratory in Sensory Processes and Perception (3) Prereq or coreq: 4230.

4460 Organizational-Industrial Psychology (3) Cannot be taken for credit by students who have credit for Management 3460. E.

4510 Personality Theories (3) Survey of major approaches to understanding human personality and its development. Prereq: 2540; 3550 or 3560.

4610 Group Processes (3) Study and experience of theory and techniques of group processing and facilitation. Those participating in 4610 are expected to continue in 4620 and 4630. Prereq: 3610-26 and consent of instructor. F.

4620-30 Seminar in Group Processes (3, 3) Didactic and laboratory experience for those qualified for further training as group facilitators. Prereq: 4610 and consent of instructor. W, Sp.

4640 Psychological Tests and Measures (3) Theory and construction of individual and group measures; survey of various methods of assessment of intelligence, personality, special abilities, and educational achievement. Prereq: 3150. F, Su.

4650 Symbolic Processes (3) Logic of signs and symbols: directed and associative thinking; memory, problem solving, and concept formation; nature, use, and development of language. Prereq: 3210 or consent of instructor.

4660 The Psychology of Language (3) Theories and descriptions of phonology, syntax, and semantics as applied to psychology and related disciplines. Recommend: 4650 or linguistics background.

4670 Cognitive Development (3) Theory and research on development of language and thinking in children and adolescents. Prereq: 3210 or 3550.

4710 Physiological Psychology (3) Nervous system and physiological correlates of behavior. Prereq: 1 yr of biology or zoology and 2520. W.

4719 Physiological Psychology Laboratory (4) Laboratory studies of nervous system and physiological correlates of behavior. Coreq: 4710. W.

4720 Comparative Animal Behavior (4) Methods and principles. (Same as Zoology 4720.) F.

4729 Comparative Animal Behavior Laboratory (4) Laboratory and field studies. Coreq: 4720. (Same as Zoology 4729.) F.

4770 Psychology and the Law (3) Physiological aspects of human behavior. Prereq: Junior standing.

4830 History and Systems of Psychology (3) Evolution of field of psychology, focusing on classic schools of thought and recent developments. Prereq: 8 hrs of upper-division psychology.

4850 Learning Theories (3) Classic and current views on learning and cognition.

4860 Programmed Learning (3) (Same as Curriculum and Instruction 4860.)

4870 Contemporary Research in Behavior of Women (3) Study of interaction of cultural and biological factors in determining the behavior of women, with emphasis on physiological mechanisms involved. (Same as Women's Studies 4870.) Sp.

4880 Afro-American Psychology (3) Review and analysis of psychological literature on Afro-Americans. Prereq: Consent of instructor. (Same as Black Studies 4880.)

5000 Thesis (1-15) P/N/P only. E

5002 Non-thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N/C only. E.

5017 Colloquium in Ethology (1) May be repeated. Maximum 9 hrs. (Same as Zoology 5017.) S/N/C only.

5019 Research Practicum (1-3) Required of all first-year students. May be repeated. Maximum 9 hrs. S/N/C only.

5050 Methods of Research in Applied Psychology (3) Techniques and principles for designing and conducting psychological research in natural settings.

5079 Practicum in College Teaching (2) Supervised participation in college teaching. S/N/C only. Sp.

5100 Developmental Psychology (3) Prereq: 3550 or Educational Psychology 2430. (Same as Educational Psychology 5100.) F, Su.

5110 Clinical Aspects of Human Sexuality (3) Nature of sexuality, societal norms and their impact on sexual identity, application, intimacy and isolation including psychosexual and psychosexual identity and models for decisions. Intended for graduate students in clinical psychology, social work, and community and mental health professions. Prereq: Consent of instructor.

5170-80-90 Proseminar in Industrial and Organizational Psychology (3, 3, 3) (Same as Management 5170-80-90.) W, Sp.

5200 Topics in Developmental Psychology (3) Prereq: 5120 or equivalent and consent of instructor. May be repeated. Maximum 6 hrs.

5300 Readings and Special Problems in Psychology (1-5) May be repeated. Maximum 20 hrs. S/N/C only. E.

5319 Field Work in School Psychology: Level 1 (2) Supervised on-the-job training in school psychology. Limited to students fully admitted to doctoral program in school psychology who are assigned to program approved field settings. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. S/N/C only. F, W, Sp.

5325 Behavioral Interventions (3) Principles and techniques for planning, implementing, and evaluating interventions derived from social learning theory. Focuses on interventions by people in community (teachers, supervisors, et al.) includes token economies and strategies for self-control.

5350-60-70 Seminar in Psychology (3, 3, 3) May be repeated. Maximum 18 hrs.

5400 Psychophysics and Scaling Methods (3) Prereq: One course in statistics.

5420-30-40 Advanced Psychological Statistics (3, 3, 3) Must be taken in sequence. W, Sp, Su, F.

5450 Human Problems in Administration (3) (Same as Management 5920.)

5490 Continuing Education in Mental Health (1-4) Topics of interest to persons in mental health and allied fields. Workshop, seminar, or lecture; topic and format to be announced. Prereq: Graduate standing or consent of instructor. May be repeated. Maximum 9 hrs.

5500 Fundamentals in Psychometrics (4) Basic ideas and orientation in psychometrics. All graduate students who plan to take or more courses in psychometrics required to take course. Prereq or coreq: 4640.

5510 Instrumentation for Psychological Research (3)

5520 Theory of Mental Measurement (3) Reliability, validity, scaling and equating, norms, combining tests into batteries. Prereq: 1 qtr or graduate-level statistics and 5500 or consent of instructor.

5530 Issues in Applied Psychological Measurement (3) Applications of measurement in community and organizational research. Prereq: Statistics 5505-70 or equivalent and consent of instructor.

5540 Probability Models in Psychology (4) Introduction to use of probability models in theory of binary test items, differential psychology, comparison of different populations in specific psychological parameters, individual choice behavior, and testing of psychological hypotheses in human and animal behavior; reliability theory and regression theory. Prereq: 1 qtr calculus or consent of instructor.

5550 Advanced Social Psychology (3) Interaction between individual and group, theories of group behavior. Prereq: 3120.

5580 Theories of Personality (3)

5581 Psychodynamic Approach to Clinical Psychology (3) Basic concepts. Selective theorists with examination of case material. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5682 Behavioral Approach to Clinical Psychology (3) Human development and strategies for behavior change from viewpoint of social learning theory. Dis-